The MINING CONGRESS JOURNAL

Volume 16 NOVEMBER, 1930 No. 11

LEAD and ZINC Number

Featuring the operations of the American Zinc, Lead & Smelting Co.

• • •

Silver—What About Its Future?
The Milling and Smelting of Lead and Zinc
Industrial Safety Training at a Mining School

• • •

The Factors Which Affect Mechanized Loading
Methods of Educating the Miner
Safety Organization in a Small Mine
Protective Clothing in Accident Prevention

• • •

Eighth Annual Meeting of Western Division
Legislative Review

Contributors

R. S. Dean, Frank M. Smith, E. H. Denny, G. M. Kintz, Howard I. Young, A. C. Eide, Charles M. Seymour, Mark H. Newman, Harley A. Coy, Charles B. Strachan, P. M. Arthur, H. J. Bolin, Robert Ammon, J. I. Wall, N. L. Allen, G. W. Johnson, Thornton Emmons, H. S. Snow, G. B. Southward, W. D. Brennan, D. L. Boyle, C. L. Lutton

MORE THAN A MILLION TONS OF "BLACK JOE COAL" HAVE BEEN MINED WITHOUT A FATAL ACCIDENT

...and our page this month is devoted to the Harvey Coal Corporation of Harvey, Ky., in recognition of this outstanding achievement.

Many factors must work together, under competent cool-headed management, to protect the lives of three hundred men for nearly three years against the many hazards of coal mining; but none is more important than safe procedure, and the use of safe materials for blasting.

It is with legitimate pride therefore that we quote the following from a letter signed by Mr. F. M. Medaris, General Manager of the Harvey Coal Corporation:

> "We have been using Ensign-Bickford Safety Fuse exclusively for the past five years, and feel that it has contributed to a very great extent in helping establish our safety record."

THE ENSIGN-BICKFORD CO.
SIMSBURY **CONNECTICUT**

Do Not "Short Fuse" --Fuse should be cut long enough for the end to extend well out of the mouth of the bore hole when the primer cartridge is in place.

All holes should be well tamped.

An RandS Rotary Car Dumper

Handles Zinc Ore at the Mascot Mine of the American Zinc Company of Tennessee

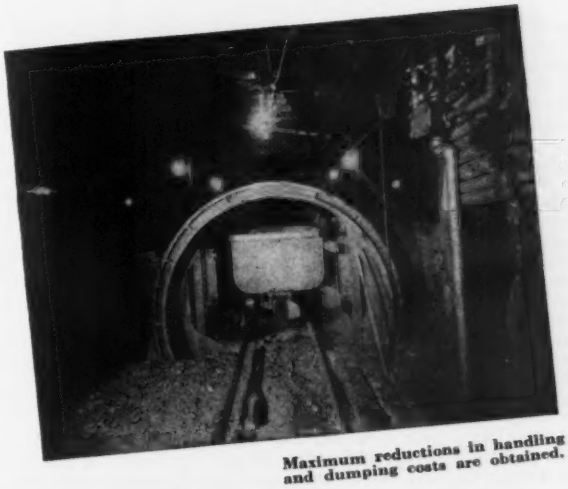
Car maintenance costs are reduced to a minimum at Mascot Mine.

RandS Rotary Car Dumpers permit the use of Solidbody Cars which cost less, have a greater capacity and require a minimum of maintenance. They also allow for coupled up dumping, a big factor in time and labor saved.

RandS Rotary Car Dumpers are made in types to suit every dumping condition — electrically and pneumatically operated, rotary dumps and shaft type gravity and electrically operated dumps. They are arranged to handle any number of cars and allow for the use of existing cars until they become obsolete and are replaced with Solidbody Cars.

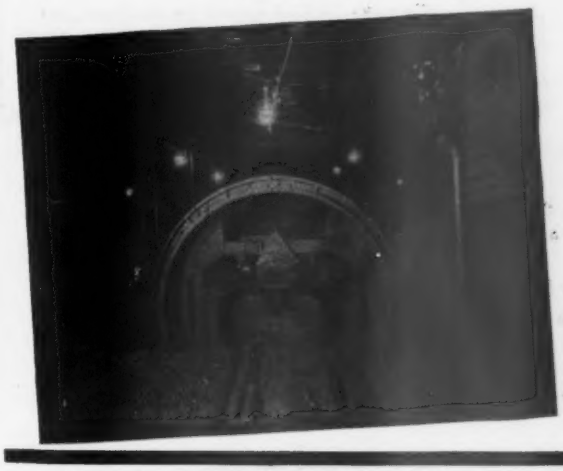
Rugged, solid plate type construction, high capacity and maintenance-free operation are featured.

Our specialized car dumper engineers will be pleased to make a careful survey of your operating conditions and to make suggestions on the dumping equipment best suited your requirements. "Consultation Without Obligation."



Maximum reductions in handling and dumping costs are obtained.

Cars of all sizes and shapes can be handled with equal facility.



The personal injury hazard is minimized. Can be stopped in any position at any time.

ROBERTS AND SCHAEFER CO.

ENGINEERS and CONTRACTORS

PITTSBURGH, PA., 418 OLIVER BLDG. WRIGLEY BUILDING, CHICAGO HUNTINGTON, W. VIRGINA, 514 NINTH AVE.

THE MINING CONGRESS JOURNAL

VOLUME 16 NOVEMBER, 1930 No. 11

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[Due to the cooperation of Mr. Guy N. Bjorge, Associate Editor, in the preparation of the articles on the operations of the American Zinc, Lead and Smelting Company, which appear in this issue, the Metal Section of the Practical Operating Men's Department is omitted]

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E. R. COOMBES, *Editor*

GUY N. BJORGE, *Associate Editor*
ERNEST H. PULLMAN, *Legislative Editor*
WALTER LUKEI, *News Editor*
F. E. PRIOR, *Art Editor*
J. M. HADLEY, *Production Manager*
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PARKER COTT, *Field Representative*
FRANK W. MORAN, *Field Representative*

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Bill and Skinny Sez 44-C Loader O. K.

BILL: Did ya ever see such nice, fine, big lump coal loaded by any machine before!

SKINNY: Naw, she sure picks it up an' handles it just as easy as if loaded by hand, an' then she takes the big lumps that you had to break up loading by hand.

BILL: The Boss is sure tickled with this fine big lump coal we are loading.

SKINNY: Yea, an' she will wade right in an' pick it up. Them birds on the other side make me sick talkin' about their loader; they has to shoot the coal all to pieces before they can take it.

An' talkin' about being sick, reminds me of one my kid tole me when he came home from school las' night. The teacher was askin' the class what was grown in India, an' some of the kids said rice, pepper, and currie, whatever that is, an' she sez "Can any of youse think of anythin' else?" an' the Super's kid pipes up and sez "Yes—Indiagestion."

Bulletin No. 503C—Completely Describes the Jeffrey 44-C Loader. Write for Your Copy.

The Jeffrey Manufacturing Company
958-99 North Fourth St., Columbus, Ohio

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New York, Chicago, Philadelphia, Pittsburgh, Scranton, Pa., Charleston, W. Va., Birmingham, Denver, Salt Lake City

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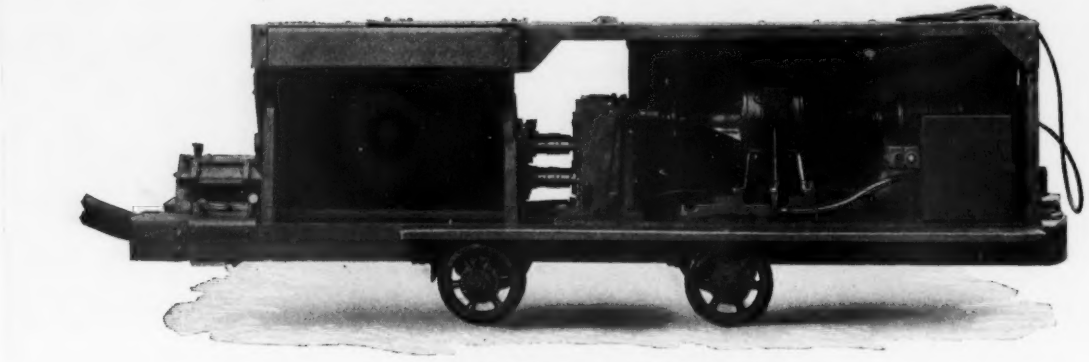
JEFFREY MFG. CO., LTD., OF CANADA: Head Office and Works, Montreal; Branch Office, Toronto; Service Station, 210 Ninth Ave., W., Calgary

JEFFREY COAL MINE EQUIPMENT

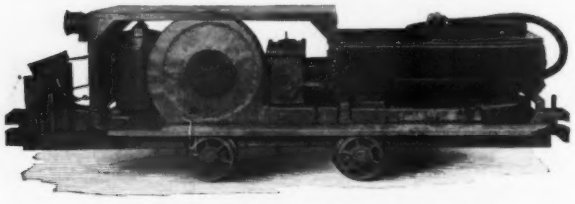
M-S-A Rock Dust Distributors



M-S-A High Pressure Rock Dust Distributor

Are Receiving the Thoughtful Consideration of the Mining Industry at This Particular Time

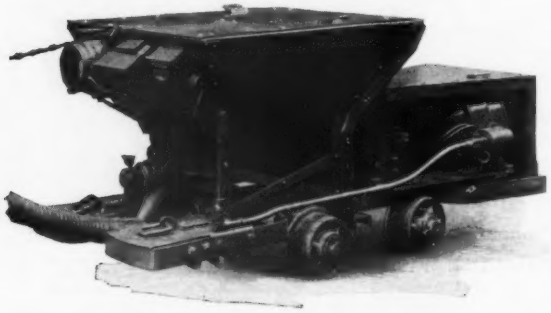
Where Complete Dusting is desired, we recommend the M-S-A High Pressure Rock Dust Distributor illustrated above. Where haulage entries, development entries and rooms are to be dusted, the M-S-A Stationary Nozzle Distributor is recommended.



M-S-A Stationary Nozzle Rock Dust Distributor

FOR THE SMALLER MINE

Or where it is advisable to supplement the work of larger machines for straight entry and room dusting, we recommend the M-S-A Type 65 Rock Dust Distributor illustrated below. The Type 65 machine can be modified where rope haulage or mule haulage prevails.



M-S-A Type 65 Rock Dust Distributor

"EVERYTHING
FOR MINE
and
INDUSTRIAL SAFETY"

Rock dusting of Bituminous Coal Mines usually reaches the peak of activity during the winter months when the mines are dry and coal dust explosions are more readily propagated.

The Mine Safety Appliances Company has pioneered in the development of rock dust distributors and offers a complete line of distributors to meet the requirements of all mining conditions.

Our 16-page booklet containing Recommended Standard Practices and illustrated descriptions of various types of M-S-A Rock Dust Distributors will be gladly sent upon request.

USE THE COUPON BELOW

Mine Safety Appliances Co.

Braddock, Thomas and Meade Sts., Pittsburgh, Pa.

MINE SAFETY APPLIANCES CO.
Braddock, Thomas and Meade Sts.,
Pittsburgh, Pa.

Send me ..... copies of Bulletin No. 213 describing Recommended Standard Practices for rock dusting coal mines and Types of M-S-A Rock Dust Distributors Available.

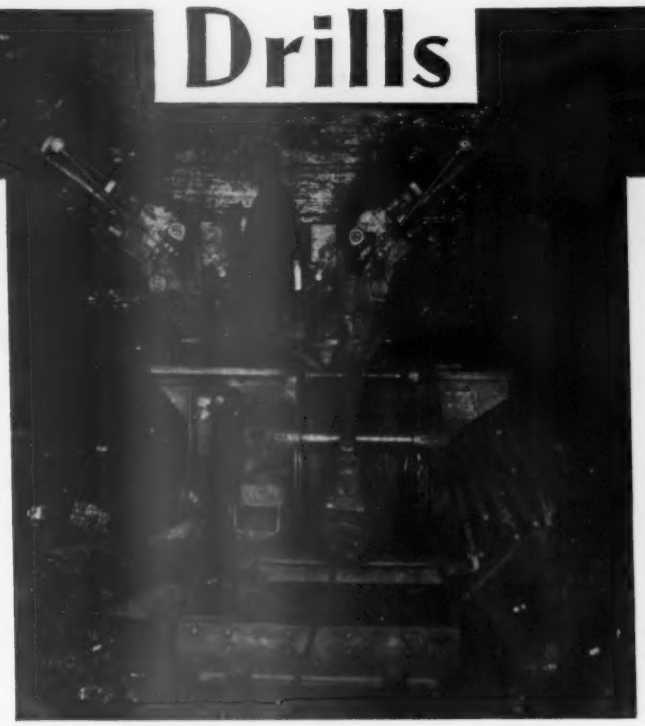
MY NAME.....TITLE.....

COMPANY.....

ADDRESS.....

.....

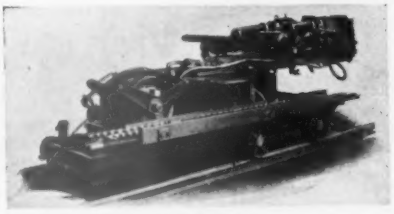
Two Drills Holes



At Once

A substantial reduction in drilling time and tonnage costs is now possible with the Jeffrey 56-A Drilling Machine. This machine drills two holes in the time previously required to drill one.

The augers, driven by independent motors and mounted on independent arms and turntables, are adjustable for drilling holes anywhere between the floor and roof without leaving the track. A larger percentage of lump coal is obtained because the holes are drilled parallel with the cleavage.



The 56-A Machine folded for tramming

With any other method of drilling, the holes are necessarily drilled at an angle to the natural layers of the coal. More power is required, and there is a greater breakage of coal. Mounted on a self-propelling truck the Jeffrey 56-A Drilling Machine has a decided advantage over unit type drills. No time is lost in unloading drills, setting them up, taking them down, or loading them back onto a truck. This drilling machine trams as fast as a gathering locomotive and does not slow up traffic.

We Shall be Glad to Send You a Complete Description of the Jeffrey 56-A Drilling Machine

The Jeffrey Manufacturing Company

958-99 North Fourth St., Columbus, Ohio

BRANCH OFFICES:

New York, Chicago, Philadelphia, Pittsburgh, Scranton, Pa., Charleston, W. Va., Denver, Salt Lake City, Birmingham

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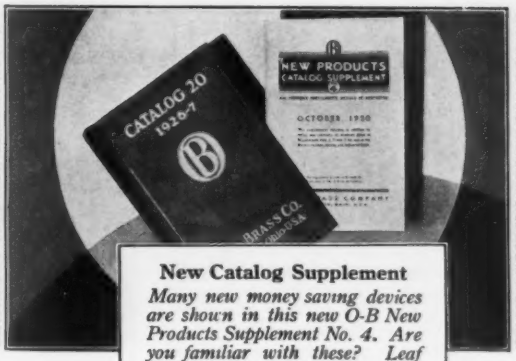
JEFFREY MFG. CO., LTD., OF CANADA: Head Office and Works, Montreal; Branch Office, Toronto; Service Station, 210 Ninth Ave., W., Calgary.

JEFFREY COAL MINE EQUIPMENT

O-B materials and uninterrupted haulage in this famous mine go hand-in-hand to make the most of Winter's opportunities.



New Catalog Supplement

Many new money saving devices are shown in this new O-B New Products Supplement No. 4. Are you familiar with these? Leaf through this booklet frequently; you will find it worth the time.

Like the "Ring" of the Cash Register

The rumble of speeding locomotives, and the click, click, of passing car wheels are to the mining man, what the "ring" of the cash register is to the store owner. Both mean money in the "till".

But let that steady rumbling and clicking cease while trolley trouble in the haulageway is being cleared, and the cost of the stalled trips mount rapidly. This is undoubtedly why O-B Bulldog Trolley Clamps are used in the haulageways of so many profit-wise mining men. They know that once a Bulldog Clamp grips the trolley wire, nothing short of a huge roof fall will break its hold. Should this happen, the jaws of the clamp release the wire without damage to either clamp or wire. The wire is again clamped in the same spot, with the same trolley clamp; and the haulageway, in short order, is again producing profit dollars.

Guarding the Flow of Loaded Cars

Every man responsible for tonnage produced must have a steady flow of loaded cars moving from the face and empties returning, if production is to be uninterrupted. Yet how many times are haulage movements suspended due to trouble in the trolley or feeder circuits! In this day of mechanized operations and big tonnage, it is vitally necessary to make sure of your line equipment.

Use O-B Hangers, and there'll be no costly delays to haulage movements caused by hanger trouble.

O-B Hangers have been in service as long as 25 years, and are still "going strong."

Mining men everywhere are specifying O-B equipment because they know it meets modern mining conditions, and insures full return from high cost electrical equipment by keeping it working at highest capacity.

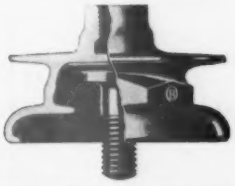
Pulls, Hits and Strikes--Everyday Happenings

The down pull of roof falls as they strike the trolley, the side strains and the impacts of flying trolley poles hitting the hanger are everyday loads placed on expansion bolts; and everyday causes for expansion bolts cracking and letting loose their hold, causing delays to haulage.

Given a strong non-brittle expansion bolt, mine electricians can keep the haulageway free of such delays. Those who use O-B Expansion Bolts have proved this to their satisfaction. They are made of non-brittle (Flecto) malleable iron. Their shell will bend double without breaking. Let the downward thrust of roof falls, let the everyday pulls, the hits, the strikes, come upon an O-B Expansion Bolt, it will take the jolts without breaking. Why not make your suspension completely O-B; hangers, clamps and expansion bolts? Then it is sure to be an installation, fool, trouble, and renewal-proof.

O-B Bulldog Clamp

This is the clamp men "swear by and not at". The jaws automatically open with the action of the head-nut. Less work—no bother—nothing to wear out. Turn to page 43, O-B New Products Supplement No. 4.



Type K-3 Mine Hanger

There are many thousands of these hangers which have been in service ten, fifteen and even twenty years, and are still good for many more years of service. Complete listing on page 490 of the O-B Catalog No. 20.

A-3 Expansion Bolt

O-B Expansion Bolts are readily reclaimable. Just back off the expanding nut, remove the bolt and pull out the shield with a hooked rod. You will find these bolts listed on page 496, O-B Catalog No. 20.

Ohio Brass Co.

NEW YORK PITTSBURGH PHILADELPHIA BOSTON CHICAGO CLEVELAND ST. LOUIS ATLANTA DALLAS LOS ANGELES SAN FRANCISCO SEATTLE

PORCELAIN INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING MATERIALS
VALVES

Elasticity with Great Strength

Cosco Troughs are made of special analyses open hearth Manganese steel plate proved by sixteen years' experience most resistant to abrasion and corrosion. Joints are accurately fitted and easily connected.

-because we build them BETTER

SERVICE costs money—no matter who pays for it.

The simplest, surest way to reduce service costs to us and loss of time to Cosco owners, is to build Cosco Conveyors so well that they require the absolute minimum of "time off."

Every detail of construction—not only basic design, but every gear, every bolt, every rivet must withstand the severest usage to which they'll ever be put.

More than four hundred successful installations in American mines speak volumes for Cosco Conveyor design—and the lowest record of "off duty" tells an eloquent story of durable service.

Let us show you positive proof of what Cosco Shaker Conveyor Drives, with the Duckbill, can accomplish in your mines—in increased production at lower cost and surer profits.

CONVEYOR SALES CO., INC.
299 Broadway, New York

District Sales Offices

Pittsburgh, Pa., 1538 Montier Street, Wilkinsburg.
Scranton, Pa., Mears Building.
Huntington, W. Va., 817 Tenth Avenue.
Knoxville, Tenn., 2725 Magnolia Avenue.
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Denver, Colo., Stearns Roger Mfg. Co.
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Chicago, Ill., 224 South Michigan Avenue.
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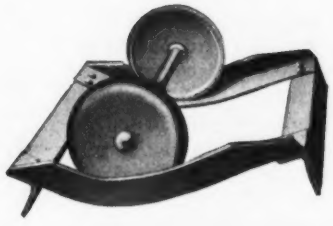
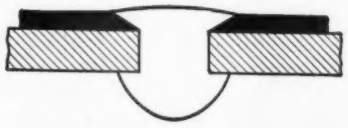
COSCO

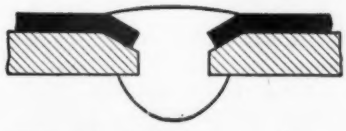
Shaker CONVEYOR



Improved Flanged Steel Rollers

Flanged and fixed to axles in one operation. Curved on inner edge to fit cradles perfectly. Infinitely stronger than rollers made from any cast materials.



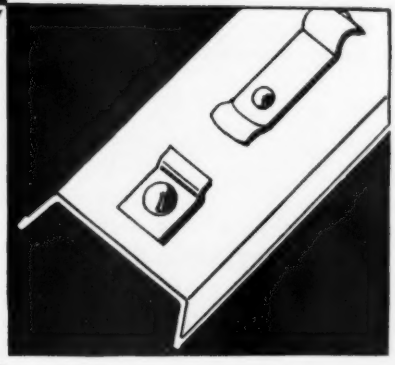


Rivets That Stay Put

Upper illustration shows the usual way of riveting troughs. Note in lower illustration how Cosco Troughs are rivetted. Practically four times as much trough metal is held by the rivet head, making unions that will not easily loosen or tear out.

"Convey Your Coal The Cosco Way"

Real Track!

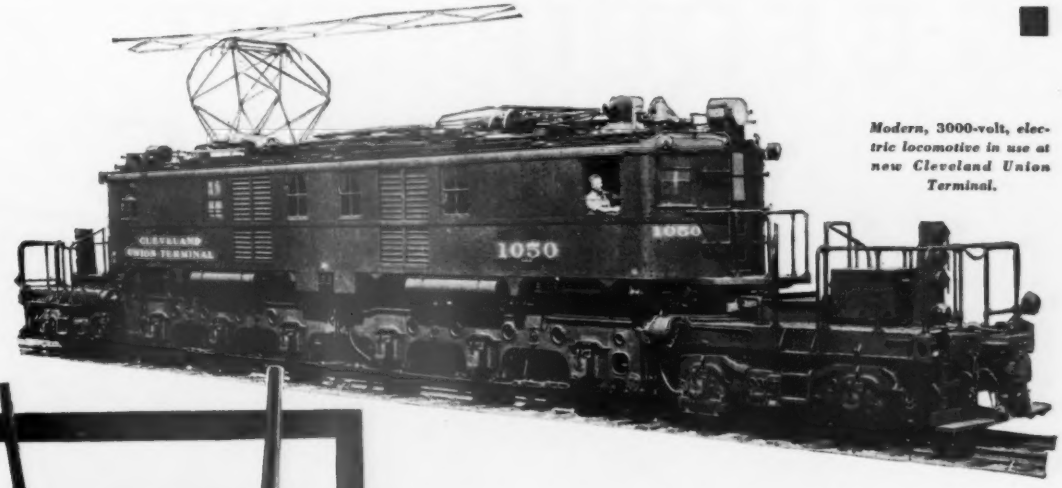


THE RETURN TRACK in a large bituminous mine in Southeastern Ohio is pictured above. Here they selected Carnegie Copper Steel Mine Ties, section M-20, for use under 40 pound rail. M-20 is only one of the large variety of Carnegie Copper Steel Mine Ties available. There is a light grooved tie for room work only $1\frac{1}{16}$" in height, weighing $2\frac{1}{2}$ pounds per foot. There is a heavy channel tie for the main haul, $2\frac{1}{4}$" high and weighing 9 pounds per foot. Whatever your need, there is a suitable Carnegie Copper Steel Mine Tie. A number of styles of clips and fastenings are also offered to meet your individual preferences.

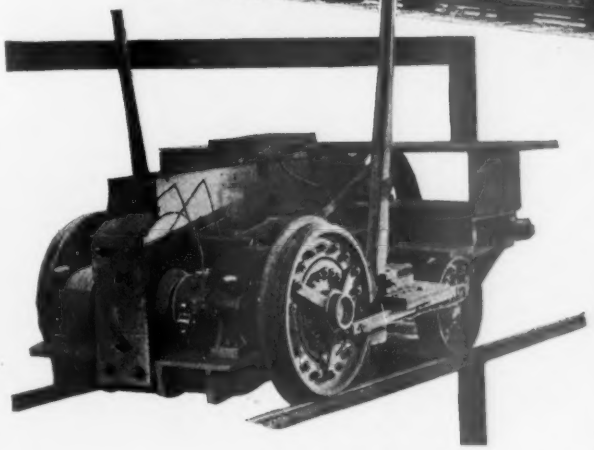
Carnegie Copper Steel Mine Ties are easily and quickly laid. They are economical. They are rust resisting. They provide the foundation for a trouble-free track, true to gauge. Catalogue on request.

CARNEGIE STEEL COMPANY - PITTSBURGH, PA.
Subsidiary of United States Steel Corporation 79

CARNEGIE
COPPER STEEL MINE TIES



Modern, 3000-volt, electric locomotive in use at new Cleveland Union Terminal.



First electric locomotive—built by Thomas Edison in 1880.

another fiftieth anniversary

JUST A YEAR AGO tribute was paid to Thomas Edison on the anniversary of his epoch-making invention—the Incandescent Lamp. This year marks another anniversary which the world may not celebrate, but which people interested in electrical progress will remember—that of Edison's invention of the first electric locomotive.

The little machine pictured at the left was built by Edison in 1880 to prove that the application of electricity to traction was practicable. It was operated with a loose belt and idler control. Hand-levers served as brakes. Current was carried by the rails, through the wheel-rims which were insulated from the axles. The motor was equipped with copper-leaf brushes.

For some years progress was slow. Then came carbon brushes which overcame the greatest difficulty—that of commutator wear. National Carbon Brushes played a vital part in the development which followed. Splendid research facilities, backed by years of experience in carbon manufacture, made possible the constant improvement of brushes.

The march of progress since 1880 is revealed in the illustration at the right, showing one of the huge 3000-volt, electric locomotives recently placed in operation to haul the many trains daily passing through the new Cleveland Union Terminal. In electric traction, as in other applications of power to industry, National Pyramid Brushes occupy an undisputed position of leadership.

NATIONAL CARBON COMPANY, INC.

Unit of Union Carbide UCC *and Carbon Corporation*

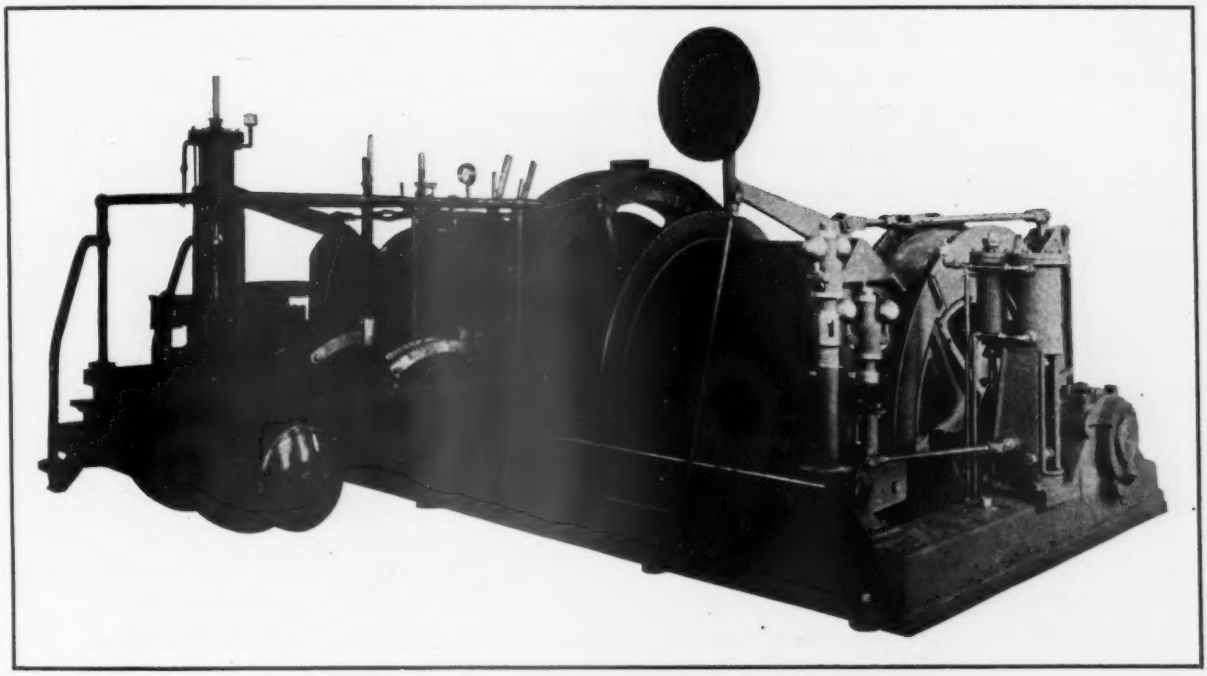
Carbon Sales Division SILVER STRAND CABLE TRADE MARK REGISTERED **Cleveland, Ohio**

Branch Offices and Factories

New York Pittsburgh Chicago Birmingham San Francisco

THE widespread use of Vulcan equipment in zinc mining as well as in every field of mining is due to the broad experience, the advanced engineering practice and the constant care maintained in meeting most exacting requirements. Vulcan has much to offer to the zinc industry from hoists such as the pictured installation at the New Jersey Zinc Company to great rotary kilns; from shaking conveyors for handling of stone, gravel, sand, clinker, etc., to sheave wheels; from room hoists to every type of steam, gasoline or electric locomotive. Whatever your mining need send for a suitable Vulcan catalog. It will suggest new economies.

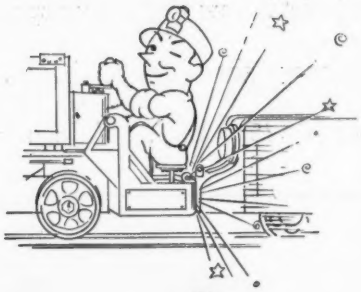
The hoist below has a rope speed of 1,000 feet per minute. Weight of the skip is 3,000 lbs. and the weight of ore 5,500 lbs. Rope diameter is one inch, pitch of slope is 57 degrees. Motor speed is 275 R.P.M. Vulcan Iron Works, Wilkes-Barre, Pennsylvania.



VULCAN of WILKES-BARRE HOISTS

"No Flimsy Protection for the Motorman Here!"

Boys, Mancha's Little Trammer *is little,* but nothing's skimped. Look at the motorman's compartment. It's made of cast steel—heavy enough to laugh at the toughest crashes. You can handle cars at either end, yet the motorman is safe. The compartment is big enough not to cramp him and he's completely inside the rugged outer dimensions. Your motorman is safe in a Mancha's Little Trammer . . . Mancha Storage Battery Locomotive Company, 1909 South Kingshighway, St. Louis, Mo.



MANCHA'S *LITTLE TRAMMER*

REPRESENTATIVES:

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E. H. Gibbes, 3505 Wayne Ave., Bronx, N. Y. C.
J. W. Cashman, 1641 Kenneth Road, Glendale, Calif.
L. P. Brassy, Sharan Bldg., San Francisco, Calif.
McCarthy & Robinson, Toronto and Montreal, Canada
J. R. Reid & Sons, Sydney, Australia
B. C. Equipment Co., Vancouver and Nelson, British Columbia
Sullivan Machinery Co., Mexico City, Mexico
Denver Rock Drill & Machinery Co., Johannesburg, South Africa
Rockfield-Carson Co., Guardian Trust Bldg., Denver, Colorado

FILL IN AND MAIL THIS COUPON

Mancha Storage Battery Locomotive Co.,
1909 South Kingshighway, St. Louis, Mo., U. S. A.

We want.....tons per shift of.....hours.

Grades { Against loads / With loads

.....%

for.....ft.

Cars { Empty.....lbs. / Loaded.....lbs.

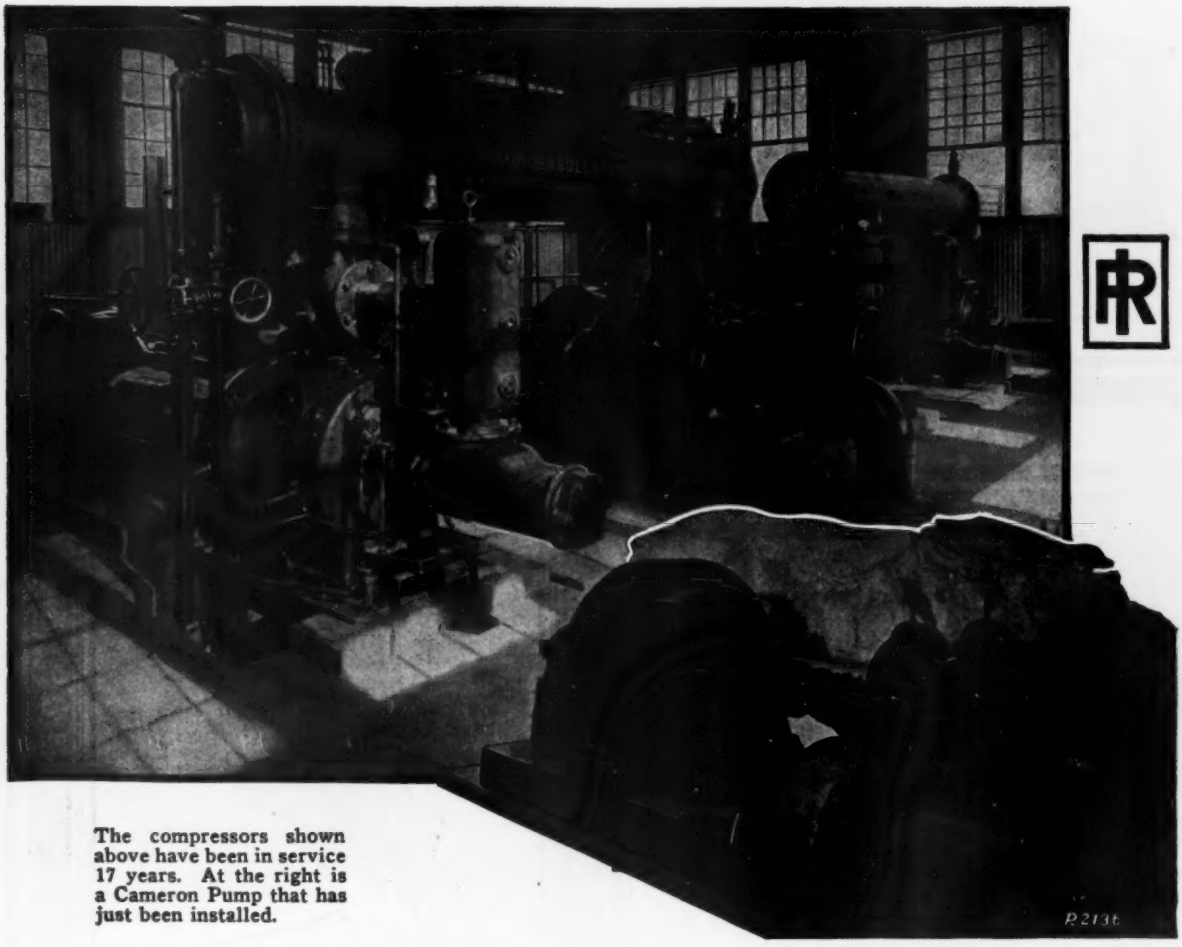
Cars have ROLLER or PLAIN Bearings?.....

Track Gauge.....

Firm.....

Name.....

Address.....



The compressors shown above have been in service 17 years. At the right is a Cameron Pump that has just been installed.

From 1913 to 1930 at Mascot, Tenn.

THE two Ingersoll-Rand Class "PE" Compressors shown above were installed at the Mascot, Tenn., properties of the American Zinc Company in February, 1913. With the exception of Sundays, they have run a great deal of the time since then 24 hours a day. They are still in use.

At Mascot the American Zinc Company uses I-R drifter drills in development drifting, "Jackhamers" for blocking in stopes and at chutes, and stopers in raise work. A recent installation of Ingersoll-Rand equipment is a Cameron No. 8 "EV" pump for underground service.

INGERSOLL-RAND COMPANY » 11 Broadway « New York City

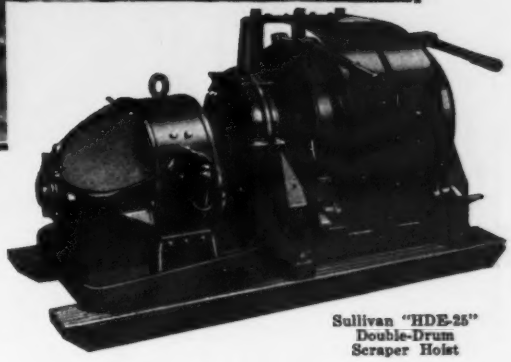
Branches or distributors in principal cities the world over

For Canada Refer—Canadian Ingersoll-Rand Co., Limited, 10 Phillips Square, Montreal, Quebec

1022-C

Ingersoll-Rand

Scraping ore to a mill hole, Mascot, Tennessee



Sullivan "HDE-25" Double-Drum Scraper Hoist

Scraping has cut ore loading costs at Mascot

"Slusher" Hoists and ore scraping, introduced two years ago, have rendered valuable service in curtailing mining costs at the Mascot operation of the American Zinc Company of Tennessee.

The broken ore in the high stopes is scraped to a mill hole, a distance of 150 to 250 feet.

One of the Sullivan "HDE-25" Electric Hoists, pulling an 1800-lb. hoe scraper, holding two tons, slushes up to 125 tons of ore in three hours.

Four Sullivan hoists, working four hours per day and five days per week, average 800 tons of ore per week.

Sullivan engineers have pioneered the development of scraper mucking in many fields. There are Sullivan Slusher Hoists in sizes from 7½ to 75 H.P. with Turbinair or Electric motors, for scraping to mill holes or chutes, or for use on slides to load cars.

Advice and blueprints concerning scrapers, slides, methods and hoists is yours at request.

Ask for Slusher Hoist Bulletin 3776-J.

Sullivan metal mining equipment—besides hoists—includes:

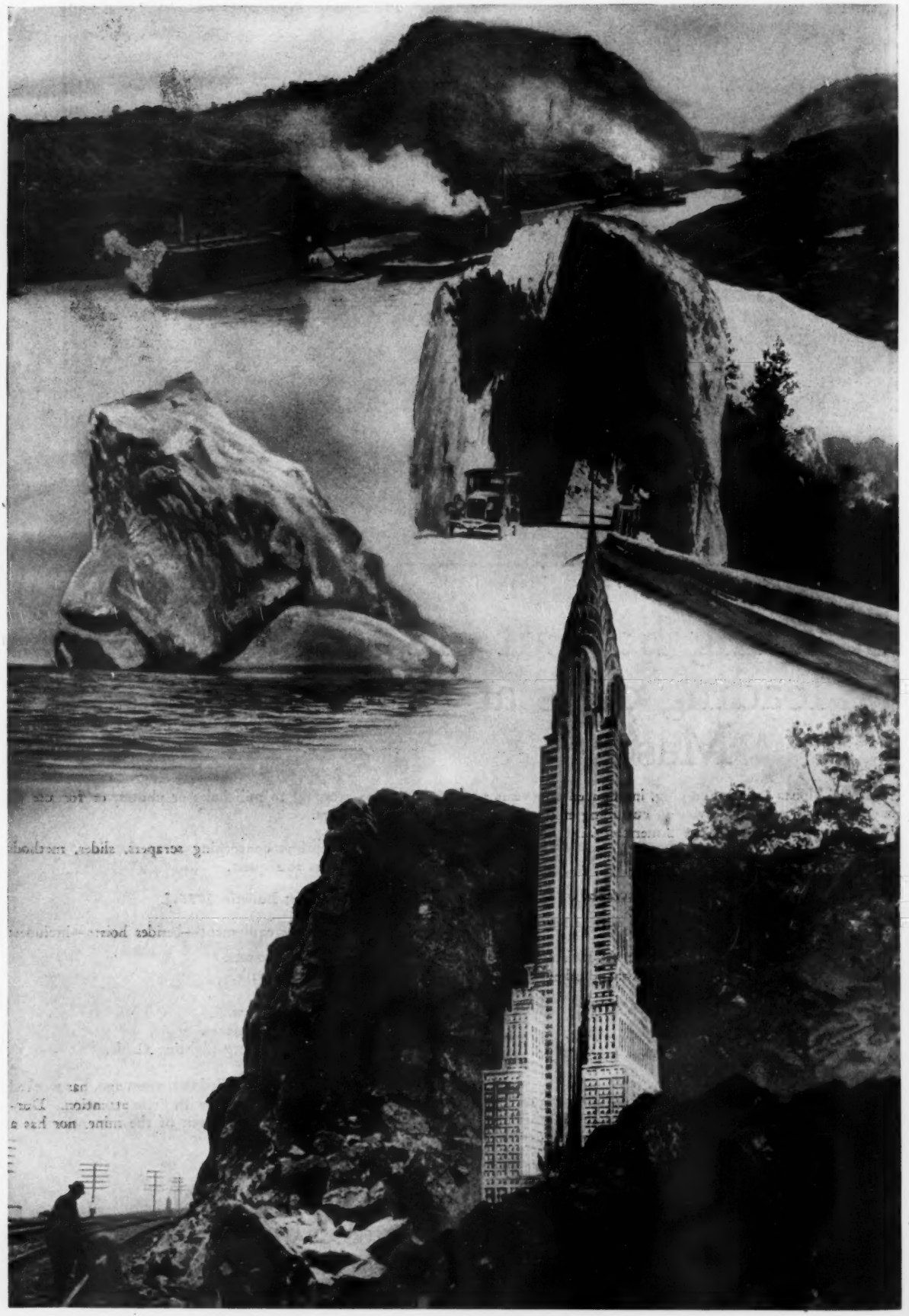
Air Compressors.
Diamond Drills.
Rock Drills.
Drill Sharpeners.
Drill Steel Furnaces.
Stringalite Safety Lighting Cable.

The initial Sullivan hoist, installed two years ago, has worked under the most severe conditions with little attention. During this period it has never been out of the mine, nor has a single repair been made to it.

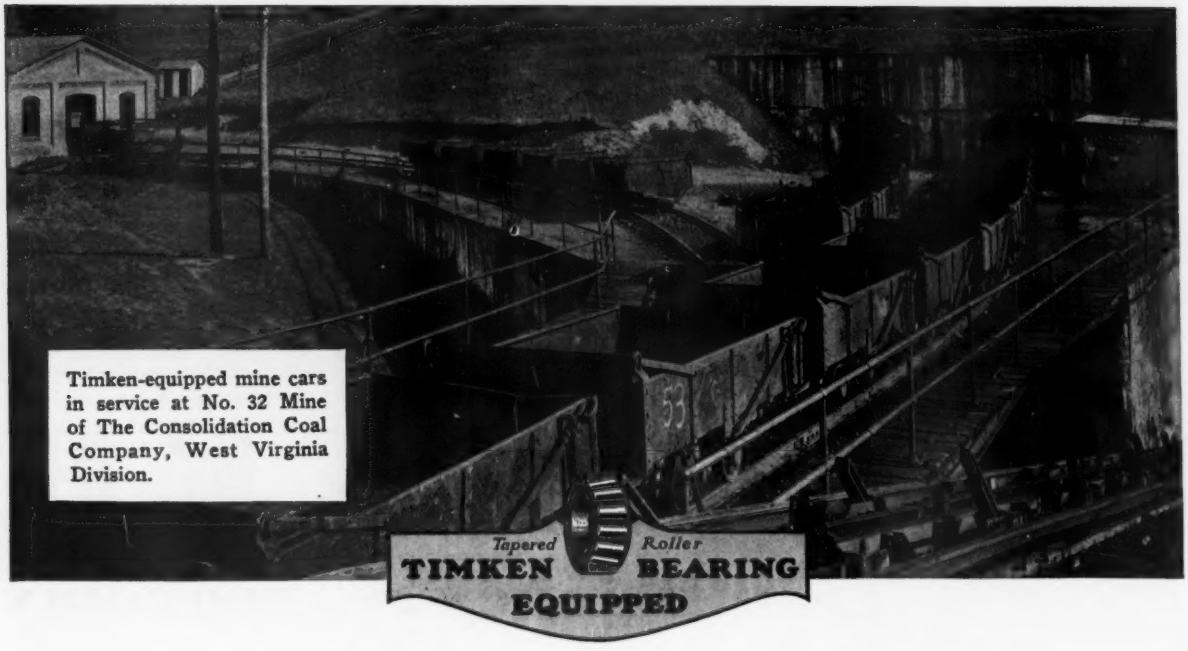
SULLIVAN Trade Mark

SULLIVAN MACHINERY COMPANY
808 Wrigley Bldg., Chicago

Offices throughout the United States and Canada and in principal mining centers abroad.



Timken *and* Consolidation



Timken-equipped mine cars in service at No. 32 Mine of The Consolidation Coal Company, West Virginia Division.

43,000 Timken Bearings *on the* Job, *and* Not *a* Single Spare *in the* Store Room!

That fact indicates not only the tremendous use of Timken Bearings by Consolidation, but also the high degree of Timken reliability under all conditions.

The Consolidation Coal Company operates 31 mines, all thoroughly mechanized in accordance with the most modern practice.

Included in this modern mechanical equipment are Timken-equipped electric locomotives, car loaders, ventilating fans, chain haul, air compressors, aerial tramway, pillow blocks, take-ups, *and more than 5,000 Timken Bearing Equipped mine cars.*

Of even greater significance than this total number of Timken-equipped cars, is the fact that during the last three years 98% of the mine cars purchased by Consolidation have been on Timkens. No coal operator in the country has had a more ample opportunity to verify the value of Timken-equipped rolling stock.

Another instance of Timken dominance in the mine car field. The Timken Roller Bearing Company, Canton, Ohio.

TIMKEN *Tapered Roller* **BEARINGS**

The
MINING CONGRESS JOURNAL

**A Monthly Magazine—The Spokesman For The Mining Industry—
Published By The American Mining Congress**

VOLUME 16 NOVEMBER, 1930 No. 11

Editorials

Lead and Zinc Industries

LEAD and zinc represent two of the three principal nonferrous metals in this country. They are vastly important in our industrial life, entering largely into the electrical, automotive and paint industries. Just how important they are is evidenced by the fact that there are 92 lead and zinc mining operations in the United States, representing an investment of approximately $200,000,000. The average annual production is a little less than a million and a half short tons, with a value of $158,000,176. These industries spend annually better than twenty millions for replacement equipment and supplies. They employ more than 10,000 workers, and have an annual wage bill of some three millions of dollars. That is quite a contribution to American prosperity and well worth considerable effort to maintain.

Such important adjuncts to our industrial life, commerce and national wealth should have the wholehearted support of the country in their efforts to survive foreign competition and to surmount their intricate production problems. This issue presents these industries. How they are meeting competition, solving the new markets problem, and contributing to our everyday needs is a story of considerable interest. The lead industry is as old as history, and zinc presents a versatility that is astounding. Their contribution to commerce and human comfort entitle them to respectful attention.

The World's Silver Problem

NO PROBLEM before the metal mining industry of the world has so universal an application as the problem of silver. As pointed out in our October issue the state of Utah must sell its lead and zinc for a million dollars more in order to get the same return for its silver-lead-zinc mines, as it would have received had the price of silver remained above 65 cents. The state of Montana in a similar way must necessarily sell its copper for a half million dollars more in order that the silver-copper mines of that state shall receive the same return as they would have received with silver at its average price for the last quarter century. Thus it will be seen that the burden upon any one of the industrial minerals, copper, lead and zinc, with which silver comes in association, must necessarily be borne by the industries consuming these metals. At the present time the mining industries must bear this burden because of the low price of industrial metals. This condition comes at a time when manufacturing industries have been curtailing operations and a lesser demand for these minerals has developed an overstocked market and extremely low prices.

Proposed Chinese Loan

WHAT is the remedy? Senator Pittman is advocating that by agreement among the commercial nations a loan of 500,000,000 ounces of silver shall be made to China in order that the administrators of its government shall be so financed that they will be able to crush the various rebellions, establish stable government over that immense empire and make possible a return to industrial activity. After careful consideration of this plan the Western Division of the American Mining Congress at its El Paso convention recommended endorsement. Undoubtedly the consummation of such a plan would be of great temporary benefit to the world's silver industry. It is equally certain that this benefit would be more or less temporary and that when this loan is repaid that the silver markets of the world would be staggered by the avalanche of 500,000,000 ounces of silver thrown back upon it for absorption. It may be said that the prosperity which would certainly be developed in China under a stable government would be such as to digest this enormous silver loan and that instead of having the loan repaid in kind it could easily be repaid in current goods which the countries of the world furnishing this silver might easily absorb.

India A Contributing Factor

IT IS probable that the great unrest in India at this time has to a large extent been fostered by the falling price of silver. It seems also probable that those foreign countries which declared for the gold standard when they were the possessors of the largest part of the world's gold might now find it to their advantage to favor a return to a larger use of silver as subsidiary coinage upon some basis of value recognized by each of the several governments involved.

Notwithstanding the fact that in most European countries the smaller denominations of coin are more greatly used by the people in business transactions, the percentage of silver in use in those countries as money is very much less in proportion to that in use in the United States.

A Remedy For Silver

IS IT not time, therefore, that instead of fearing the ghost of 16 to 1 and Bryanism which are none the less to be feared now than in 1896, that we recognize the fact that the world's growing business transactions, the world's increasing wealth, the prosperity which depends upon maintenance or increase of price levels, would all be benefited by a system which does not depend upon the diminishing gold supply for its standard. The increasing price levels in this country cut its gold production from $105,000,000

in 1915 to $43,000,000 in 1929, while the amount of gold used for industrial purposes reached the sum of $80,000,000. In other words the United States is using for its own monetary purposes almost double the amount of gold which the country is producing. Notwithstanding the great falling off in American production the world's production of gold has not greatly decreased, yet it is confidently asserted by those most familiar with the facts that the great gold supply, the Rand of South Africa, will within a few years be greatly curtailed and it must be recognized that with a growing demand for a monetary basis and an increasing amount of gold as that foundation the structural credit erected thereon will some day become top-heavy and a withering panic shattering prices to starvation levels will necessarily result. Is it not time for the statesmen of the United States to face this situation and to ask that other leading nations of the world shall join with them in an investigation of the world's monetary systems with a view of stabilizing world business conditions for the benefit of all concerned?

It can with certainty be predicted that until there is some stabilizing force which can determine the price of silver so that it can with safety be used in world currencies, there can be no permanent solution of the silver problem.

Laurel Wreaths

IN a defense of the Republican Administration, Simeon D. Fess, in a recent speech, called attention to the industrial self-sufficiency of the United States, pointing out that although "the United States has but 6 percent of the world's population, it can almost build, clothe and feed the world." He further points out that we produce "43 percent of the world's output of coal; 54 percent of iron; 64 percent of steel; 49 percent of copper; 64 percent of petroleum; and 51 percent of the world's output of lumber. We also produce 69 percent of the world's cotton and build 84 percent of the motor vehicles of the world."

And while we are establishing records, the mining industry modestly presents the fact that it contributes 22 percent of our Federal income; 54 percent of all of the freight on all of our railroads; represents an investment of more than twelve billion dollars; and spends annually more than three hundred and fifty millions for replacement equipment and supplies. It employs approximately a million workers, with an annual pay roll of more than one and a half billion dollars.

Reducing Competition

IF we are to judge by recent statements of President Hoover, it would appear that the present Administration is inclined to favor some method which will permit industry to stabilize its production. The great basic industries in special need of assistance along this line are coal, oil, copper and zinc. Anything that may be done to help them will go far toward stabilizing present industrial conditions.

Mr. Hoover advocates that something be done about the inability of coal producers to get together to eliminate the "destructive competition" that has "destroyed and reduced to poverty those within it." In his address before the American Federation of Labor, the President said:

"It is this process of readjustment that partly causes our present difficulties in the bituminous coal industry. In that industry the encroachments of electrical power, of natural gas, of improvements in consumption have operated to slow down the annual demand from its high peak, leaving a most excessive production capacity. At the same time, the introduction of labor-saving devices has decreased the demand for mine labor. In addition to its other difficulties must be counted the effect of the multitude of 6,000 independent mine owners among 7,000 mines, which has resulted in destructive competition and final breakdown of wages.

"All these conditions have culminated in a demoralization of the industry and a depth of human misery in some sections which is wholly out of place in our American system. The situation has been under investigation of our Government departments, by Congress, together with commissions and committees of one sort or another, for the past 10 years. The facts are known. One key to solution seems to me to lie in reduction of this destructive competition. It certainly is not the purpose of our competitive system that it should produce a competition which destroys stability in an industry and reduces to poverty all those within it. Its purpose is rather to maintain that degree of competition which induces progress and protects the consumer. If our regulatory laws be at fault they should be revised."

We agree with Mr. Hoover that "something should be done about it." Numerous efforts have been made with that objective in view. The Federal Trade Commission was created; an Oil Conservation Board was appointed; commissions have studied the coal industry and recommended certain remedial things, but so far none has been effective. But the fact remains that ways and means must be found for collective curtailment of over-production, and the Sherman Law must be modernized in such a way as to permit producers of raw materials to stabilize their industries and conserve their resources. No more important problem faces the mining industry.

Captive Tonnage

RECENTLY, the theory was advanced that the coal industry is rapidly being acquired by large interests, who consume vast tonnages of coal. That is, that the railroads, the public utilities and big industries like Ford and U. S. Steel were producing their entire requirements and consequently were buying coal lands and increasing their present mining capacity.

The idea intrigued us. So we donned our statistical glasses and delved deep into the subject. There appears to be no real basis for the idea. There apparently is no visible trend toward big industry increasing its coal production to meet its requirements. If anything, the contrary. The railroads, the public utilities, the great industries like steel, automobiles and large manufacturing industries, instead of producing more coal are increasing their purchases of it. As a matter of fact, the only industries that have increased their own production of coal during the past 10 years are by-product coke plants, which in that period have increased from 7 to 12 millions of tons. These are the facts:

The railroads produced 27,000,000 tons and used 120,000,000 tons.

Public Utilities (Electric and Gas) produced 9,000,000 tons and used 46,000,000 tons.

By-Product Coke and Steel produced 69,600,000 tons and used 100,000,000 tons.

All other industries produced 10,000,000 tons and used 104,000,000 tons.

It will be noted that combined the so-called captive

tonnage in the coal industry represents less than one-fourth of our total production; even the steel and by-product plants buy approximately one-third of their requirements on the commercial market. It is interesting to note that the figures covering these statistics have remained almost stationary for 10 years.

Perhaps it will come, this control of the coal industry by a few great consumers and producers. But the beginning is not yet in sight.

The Metal Miners at El Paso

SOME six hundred and fifty mining men, representative of the great mineral producing West, met at El Paso, Tex., during the week of October 13. Delegates from every western state participated in discussions of the problems that confront metal producers, and the program presented something of interest to everyone. The Western Division of The American Mining Congress brought the group together, with the American Institute of Mining and Metallurgical Engineers, the West Texas Geological Society, the El Paso Chamber of Commerce, the American Association of Engineers and the Mexican Centro Nacional de Ingenieros cooperating and participating.

It was a friendly, constructive and far reaching meeting. Resolutions were presented which if acted upon will do much to bring about greater prosperity in metals. Silver occupied a conspicuous place on the program, as did the production problems of copper, lead and zinc, and gold. Economic problems involved in the production of these minerals, as well as scientific methods for their efficient extraction, were discussed.

These Western Division meetings, which have been held annually in different sections of the West, have a wide influence. They have brought about a closer cooperative spirit between the producers of the minerals and between the national organizations cooperating in their development. The Western Division is an amalgamation of all of the mining organizations of the western mineral producing states and as such represents the best thought of that section of the mining industry. Its recommendations should carry great weight in the industrial life of the West.

An American Basis of Wage

PRESIDENT HOOVER'S "philosophy of mutual interest" as the sound platform for capital and labor will meet with the approval of all thinking people, whether they represent either of the so-called divisions of American industry. Mr. Hoover, in his address before the American Federation of Labor, gives the following as his conception of the basis of understanding between those who employ and those who are employed:

"* * * that industry must be constantly renovated by scientific research and invention; that labor welcomes those labor-saving devices; that labor gives its full and unrestricted effort to reduce costs by the use of these machines and methods; that the savings from these reduced costs shall be shared between labor, employer and consumer."

Mr. Hoover is very careful to point out, however, that such a conception does not gain favor overnight; that its universal acceptance must be slow, because the idea is new and completely at variance with the doctrines that have been advocated for more than a hundred years.

Few will deny that some such doctrine will eventually prevail and, given leaders with vision and wisdom, the day will be hastened. So far, the great problem of finding new jobs for the men who have been displaced by the machine has been comparatively simple. New industry has absorbed them. But this problem is increasingly difficult and it will take leadership of a superior quality to keep pace with science and invention. The mining industry is facing this problem, going through a period of readjustment and, while it is now perplexed, there is no reason, viewing the future in the light of past accomplishment, for any pessimism concerning our ability to meet the situation.

The High Wage Theory

"THE High Standard of American Living" has become a familiar phrase. It is on the tongue of every politician, every labor leader and every reformer. It is frequently pointed out that the "American Scale of Living" demands a high wage scale in all industry, and none is louder in proclaiming that fact than the labor leader, who, when he finds that industry can stand no further increase in wages, urges shorter and shorter hours as an equivalent.

We have steadily maintained that the mining industry, at least, should be operated upon the theory that it is a three-cornered affair, each having a special interest—the producer, the worker and the consumer. We believe that the fellow who invests his capital, which creates a job for the worker and a product for the consumer, is entitled to fair return on that capital, plus an additional safeguard for a rainy day; we believe that the worker, who produces the product which enables the employer to put his money at work, is entitled to the very highest wage consistent with sound business economics; and that the consumer, without whom neither capital nor labor could be employed, should be given a product at a reasonable cost.

When capital is greedy, labor is dissatisfied; when labor is greedy, capital withdraws; and when the consumer refuses to purchase and the market disappears or dwindles, the result is calamity to worker and producer.

Whether or not high wages are the solution to our present economic difficulties, we agree that high industrial wages are desirable, if not essential, because labor is also a heavy consumer of his products. However, high wages must not kill the goose that lays the golden egg, and it must not be forgotten that labor's wage must be paid out of earnings. He can not receive more than he produces. A market for his product is an important essential.

Secretary of Labor Davis advocates: "The main need is to get the wage scale up, to increase purchasing power, to enlarge the market, to help more people to consume more and finer things." America today produces more than she consumes. But there still are many people without food, or shoes, or automobiles. Would they purchase them if their wages were sufficient? Is it not true that America produces more than she can *buy*, not more than she can *consume?*

That this country is a believer in high wages is attested by the result of an investigation by the National Bureau of Economic Research, which showed all workers received a total of $50,000,000,000, compared with our national income of $90,000,000,000.

Misrepresentative Government

OUT in Illinois a candidate for an important public office is being opposed because of a promise to abide by the will of a majority of the people of that state as expressed through a public referendum.

Most of these opponents will readily avow our Gov-

ernment to be among the best in the world. Most of them would bitterly criticize any public official who acts contrary to the principles of the platform upon which he was elected. Most, if not all, of them profess to believe in representative government and yet because of the possibility that the result of the public expression may possibly differ from their own upon one of many public problems, they are ready to oppose a candidate who agrees to carry out the wishes of the majority. Representative government is doomed the moment its representatives set up their own judgment in place of the expressed wish of that part of the public which they misrepresent.

Junior Managers

THE trained man for a job has become a slogan of American industry and a necessity in this age of mass production. It is imperative that the men in all key positions shall be especially trained executives, whether the job be that of foreman, superintendent or president. There is no more important question before the mining industry and particularly before the coal branch of that industry than that of the properly trained workman. A recent article by a man who belongs to the manufacturing industry presents some interesting and helpful suggestions, which may well be heeded by the mining industry. This article on the "Selection, Training and Appraising of Workmen" points out that to raise the standard of foremanship it is necessary to do three things: "have a definite method of selection, a definite method of training and a definite method of appraising." It points out that few companies have any very definite ideas about the subject; that they are likely to leave selection of foremen to the superintendent; that little success has attended the introduction of college men into these jobs, because the supply of such men is entirely inadequate compared with the demand. It advocates promotion from the ranks, made possible by raising the standard of the entire working force through courses of education and training; the special training of foremen along the lines of costs and the relation of costs to competition and last but not least, the development of a sense of importance and responsibility in the foreman—the development of the idea that foremen are "junior managers."

While these ideas are presented as a guide for the manufacturing plant, they are equally desirable for the mine. Many of the big mining companies have adopted some definite form of foremen training. The State Mining Schools in many instances are cooperating with the companies in developing and training men; there are many independent agencies advocating various methods of meeting the situation. In the metal industry the problem has not been so serious as in the coal industry, where much that is being done is still in the experimental stage. Such companies as the Stonega Coke and Coal Company, Pittsburgh Coal Company and Consolidation Coal Company, to mention only a few, are working out definite ideas and have fairly well crystallized their plans along this line. Their success is indicative of the interest that is being shown by the workmen themselves. It is interesting to note that in West Virginia 87 percent of the men who attend the night mining school pass their examinations.

Mr. John F. Tinsley presents this sound doctrine as the basis of procedure for all industry:

"After all, the human end is the most vital part of business, and we ought to consider that our business, instead of being made up of so many departments, inanimate and more or less indefinite, is made up of groups of individuals under supervision, and our statements and records, which we expect to guide us in directing our business, are the result really of the performances of those various groups. So it seems to me that we should develop as a part of our duty in executive management the determining of the performances of such groups, and to do that we have to look for better foremanship, in order that we may get from each group a plus and not a minus performance."

Control of Industry in War

FOR the past 10 years the War Department has been giving serious consideration to the control of industry and price regulation during war. Recently, Assistant Secretary of War, F. H. Payne, made public the plans of the Department in an address before the U. S. Army Ordnance Association.

The plan proposes a great organization, under the control of the President, composed of professional men, agriculturists, financiers, labor representatives, transportation systems and manufacturers, which would control and direct the use of all of our material resources.

In announcing the plan, Mr. Payne said:

"Through a centralized industrial organization the government will control the uses of raw materials, power and money and determine upon prices for commodities and services. There is no intention of purchasing or otherwise taking possession of the nation's industrial establishments. But they must do their duty to the nation, just as does the soldier on the battlefield—and the industrial organization will be the President's agent to tell them what that duty is.

"Control exercised by such a body will be in many cases indirect, but none the less effective. Public opinion, governmental regulation and, in extreme cases, the power of the government to commandeer real and personal property will be available to enforce the decisions of this organization. Through the trade associations into which American industry has aligned itself, this governmental organization of business men will be in close touch with changing conditions, and will be able quickly to transmit its wishes to corporations and to individuals."

It is pointed out that legislation will be necessary to permit of the creation of such a controlling body, and bills already have been drafted looking to the perfecting of the suggested plan.

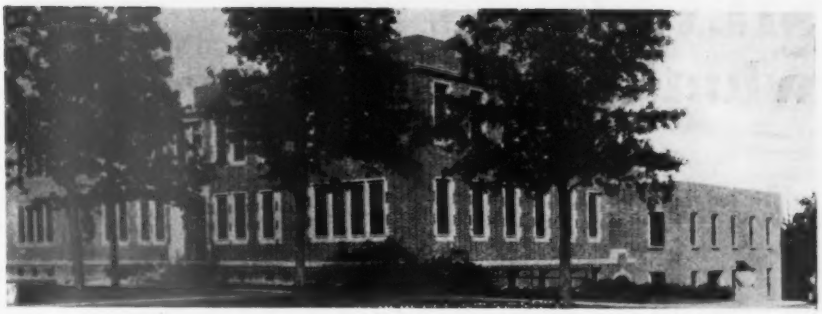
Recognizing Russia

PASSING opinions upon international affairs is not one of the functions of this editorial page, but the following, from a recent editorial from that estimable paper, *The Wall Street Journal*, is so pertinent, so clarifying of what should be America's position on recognizing Soviet Russia, that we can not withhold our endorsement. It says:

"The Russian Government is pledged to world-wide revolution; to the overturning of all civilized governments, including ours; it hates all Christian civilization and culture, and would smash it if it could. Recognition would imply national respect and friendship for the government holding such principles. That could not be the attitude of the United States. The act of recognition, as Elihu Root once said, would be a 'formal and solemn lie.'"

If all of the business reasons in the world were gathered together and launched enmass against the above, they could but meet defeat against such a solid rock of American honor and principle.

by **R. S. Dean**†



The U. S. Bureau of Mines Mississippi Valley Experiment Station, located in one of the Missouri School of Mines and Metallurgy buildings, Rolla, Mo.

The MILLING and SMELTING of Lead and Zinc*

. . . . . *Investigations of the U. S. Bureau of Mines*

LEAD and zinc have received at least a fair share of the investigative efforts of the Bureau of Mines, and the bureau investigators have at various times concerned themselves with almost every phase of the milling and smelting of these important metals.

Milling

In starting work on the metallurgy of lead and zinc ores, it is necessary first of all to know the grain size of its mineralogical constituents to learn if cheap mechanical means of separating the various minerals may be used; and if so, to what extent the ores should be treated by gravity concentration or by flotation. In answering this question, the Bureau of Mines has examined ores microscopically from practically all the districts of the United States.

The more coarsely grained ores from which much lead concentrate has been made by jigging have lessened in amount in many districts so that less emphasis is now put on studies of jigging. Where gravity concentration by tabling is still important, however, classification has been found of particular interest where a final tailing was to be discarded, for if slime in this case is not all sent to flotation large losses may be suffered. Classification for tabling has been found particularly effective in the districts in Idaho and Missouri, where the industry and the bureau have cooperated.

In the bureau's earlier work on the flotation of lead-zinc ores, pure minerals were sometimes used at first in order to study the importance of the different variables of the flotation circuit separately, paying particular attention to the reagents employed. While some of the chemical phases of flotation, like the influence of zinc sulphate on inhibiting the oxidation of deleterious ferrous sulphate by lime and air have been studied, in the present stage of the development of flotation reagents, much effort is being spent on the reduction of the high milling cost incident to fine grinding. This work is along two lines: First, a study is being made of fundamental factors like the actual power input necessary theoretically to produce more surface, and the effect of changeable conditions in the grinding circuit on the power; and, second, the concepts gained from these studies are being applied to plant practice.

Hydrometallurgy of Zinc

The chief loss of zinc in hyrometallurgical processes is as insoluble compounds — largely zinc ferrite — left on roasting zinc concentrate. Studies have been published of the conditions under which these are formed and of a method to make them soluble. In general, they may be dissolved in two ways—by stronger conditions of solvent action that will dissolve the iron in the ferric state as well as the zinc, or by reducing the iron compound by some means, which step will free the zinc. The formation of another objectionable compound, soluble silicates, has been studied, together with means of treating the compound. Heating finely divided silica with the common bases at roasting temperatures will produce soluble silicates. Lead oxide is the most effective of these bases.

Pyrometallurgy of Zinc

A study of methods to remove cadmium from zinc concentrate prior to retorting is nearing completion.

The bureau has made extensive investigations of the fundamentals of zinc pyrometallurgy from the thermodynamic standpoint, the results of which have been collected in Bulletin 324, "Zinc Smelting From a Chemical and Thermodynamic Viewpoint," by Chas. G. Maier. These investigations have indicated new methods of zinc reduction, the further study of which is now an active project of the bureau.

The first of these methods to be studied for commercial possibilities is gaseous reduction. In smelting by the ordinary retort process, two reactions take place which may be written—

$$\text{(a)}\ ZnO+CO \rightarrow Zn+CO_2$$
$$\text{(b)}\ CO_2+C \rightarrow 2CO$$

The first of these reactions proceeds rapidly and a very considerable percentage of CO_2 may be present before the reaction proceeds from right to left at temperatures above 1,000°C. On the other hand, reaction (b) is slow and the total process is limited to the speed of this reaction. Further, this reaction requires a much higher percentage of CO for equilibrium at high temperatures, so that the reducing gas will be used less efficiently.

From these considerations and others it appears that steps (a) and (b) should be separated in practice. This will be accomplished by reducing the ZnO in a gas stream.

Methane has certain very attractive properties as a reducing gas, because by proper temperature control the reaction may be made to proceed according to the reaction—

$$ZnO+CH_4 \rightarrow Zn+CO+H_2$$

in which case no oxidizing gas will be present to interfere with condensation.

Further data on the possible practical application of this reaction are being obtained. (*Continued on page* 808)

* Published by permission of the Director, U. S. Bureau of Mines.
† Chief Engineer, Metallurgical Division, U. S. Bureau of Mines.
U. S. Bureau of Mines photograph.

SILVER— what about its future?

Frank M. Smith*

WHEN I was asked a few days ago to address this convention on the subject of silver, I shrank from the task, because I realized the futility of attempting to cover such a vast subject in the short time allotted to me. Nevertheless the price of silver is of such vital importance to the base-metal mining industry of this country that the subject is a timely one for discussion at a convention of mining men such as this. The subject is an intricate one, with innumerable ramifications, and at best only a few of the high spots can be mentioned in an informal talk of this kind. The literature on silver is extremely voluminous, and, while probably no one man has read it all, yet many of you have read a great deal of it. So, with apologies to such of you who have made a study of this most interesting topic, I will attempt to give a slight insight into the present silver situation.

For centuries, as far back as history goes, silver has been used as a money metal, and its value for the most of this time had a more or less fixed ratio with respect to the value of gold. In the days of the Roman Empire this ratio was about 12 to 1, which was the ratio of the production of silver to that of gold. Strange to say, the relative total production of these two metals has not deviated very much from this ratio all through the ages. There have been variations in the ratio during certain years of heavy silver production, as in the Comstock days, and of heavy gold production in the best years of the Rand. So far as reliable records are available, the total silver production of the world to date amounts to about 14 times that of gold in ounces. In 1929 the production was in the ratio of 13 to 1, but the present value of silver is only about one-sixtieth that of gold.

Gradually the nations of the world began to lean toward a gold standard, and demonetization of silver followed in successive steps by various countries. One of the first, perhaps, was Germany, in 1816, and by the United States in 1873 and in 1893.

During the years that followed the price of silver was subject to violent fluctuations due to various causes. During the period from 1904 to 1916, the price ranged between 50 and 68 cents per ounce. In 1917 the average price was 82 cents, gradually increasing to $1 per ounce in August, 1918. From September, 1918, to April, 1919, the price was fixed by the United States Government at 101⅛ cents. The Pittman Act was passed on April 23, 1918, as a war measure to permit the sale of something over 200 million ounces of silver to England, for the purpose of stabilizing silver exchange in India. We had this silver in the Treasury in the form of silver dollars, which were melted up and shipped to India. The price paid by England for this silver was $1 per ounce, plus the cost of melting and handling, or approximately $1.01 per ounce. The act provided for the replacement of this silver to the Treasury by purchase from American producers at $1 per ounce. No purchases were made, however, until June, 1920, because up to that time the market price of silver was above $1 per ounce, and hence the American producer could do better in the open market. In May, 1919, the market price averaged 107 cents per ounce, and during the next few months rapidly advanced to over $1.32 per ounce in January, 1920. Then began a decline to 91 cents in June, 1920, when American producers began to take advantage of the Pittman Act and sold their silver to the Government. These purchases, under the Pittman Act, continued until about June, 1923, before the total amount sold to England had been restored to the Treasury. During this period, when the American producer was obtaining $1 per ounce for his silver, the world price averaged 62.5 cents per ounce in 1921, 67.5 cents in 1922, and 64.8 cents in 1923. Thus, while it was effective, the Pittman Act was of great benefit to the American silver producers. During the next three years—1924, 1925, and 1926—the average yearly silver prices were 66.7, 69.0 and 62.1 cents, respectively.

In 1926 silver received another severe jolt, when the Royal Commission on Indian Currency and Finance published its report recommending that India be placed on a gold exchange standard, which resulted in the Indian Government's establishing a policy of selling on the open market from time to time its excess stocks of silver, which amounted to several hundred millions of ounces. Immediately upon this announcement a rapid decline in the market price began, and by December, 1926, the price had reached 53 cents per ounce, and in December, 1929, the price averaged about 48.5 cents per ounce. Even this was not to be the bottom, for early in 1930 another drastic decline occurred, which reached its culmination on June 21, when the price touched 33¼ cents per ounce, the lowest price ever recorded for silver in all history. Since then there has been a slight recovery, and the present price is around 35 cents per ounce.

Production of Silver

NOTWITHSTANDING the persistent decline in silver prices in recent years, the world production of silver has increased, although the United States production has remained fairly constant. The figures in Table 1 are taken from the 1929 Yearbook of the American Bureau of Metal Statistics.

For the same years, the silver production of North America in fine ounces is shown in Table 2.

Thus, the United States, Canada and Mexico produced during the past three years approximately 73 percent of the total world production.

Of the United States production in 1927, according to the Bureau of Mines, Mineral Resources (1927), about 20 percent came from dry, or siliceous, silver ores, while the remaining 80 percent came as a by-product from lead, copper and zinc ores, or combinations of such ores. While the figures are not yet available, it is probable that in 1929 not to exceed 15 percent of the United States production came from dry, or siliceous, silver ores; and because of the extremely low prices prevailing this year it is fair to assume that less than 10 percent of the total United States production in 1930 will be derived from dry, or siliceous, silver ores.

This indicates clearly that at present prices it does not pay to mine dry, or siliceous, ores where the values are largely in silver, and in consequence such mines are pretty generally closed

* Smelter Director, Bunker Hill & Sullivan Mining and Concentrating Co., Vice President, American Silver Producers Association.

TABLE 1

Year	World production (oz.)	United States (oz.)	Percentage of total
1926	253,049,173	60,918,000	24.07
1927	253,121,265	59,412,000	23.47
1928	254,869,163	56,149,000	22.03
1929	261,265,718	60,180,000	23.03

TABLE 2

	1926	1927	1928	1929
United States	60,918,000	59,412,000	56,149,000	60,180,000
Canada	22,371,924	22,736,698	21,936,407	23,180,155
Mexico	98,291,000	104,575,000	108,536,000	108,701,000
Totals	181,580,924	186,723,698	186,621,407	192,061,155
World production	253,049,173	253,121,265	254,869,163	261,265,718
North America percent of total	71.7%	73.7%	73.2%	73.5%

down. It so happens that this year has witnessed a sharp decline in the prices of the base metals — copper, lead and zinc—from the ores of which the greater part of the silver production in recent years has been derived. As a result, many of the copper, lead and zinc producers have either closed down or have greatly curtailed production; therefore, there will undoubtedly be a substantial falling off in the production of silver, not only in the United States but also in the world for 1930.

What About the Future?

WHAT the future holds in store for silver no one can predict. With practically every country in the world on a gold basis, with the exception of China, silver is no longer a money metal, and its use, even for subsidiary coinage, has greatly decreased. England, France and other nations have debased their subsidiary coinage to such a degree that the lessened demand for this purpose has been one of the contributing causes of the decline in price.

There is very little hope that the world will again adopt bimetallism as a money standard, at least not for some years to come, although signs are accumulating and many economists assert that because of the gradual decline in gold production, the time will come, and perhaps soon, when there will not be enough gold in the world to serve as a safe metallic reserve against our rapidly mounting credits. This may eventually force the nations of the world to the use of silver for money on the basis of some fixed ratio with gold. The time has not yet arrived for this, and in the present unsettled world conditions it would be futile to demand or agitate for a world monetary conference to bring this about.

In this connection, I wish to commend to those of you who have not already read it, a most excellent and scholarly article recently published, entitled "The Silver Situation as of June, 1930," by Francis H. Brownell,[1] chairman of the Board of the American Smelting and Refining Co. In this paper Mr. Brownell reviews the history of silver and suggests certain things which might be done to bring about higher prices for the metal.

[1] September, 1930, issue of The Mining Congress Journal.

American Silver Producers' Association

AS a result of the historic silver convention which was held in Reno, Nev., in September, 1923, the silver producers of the West organized under the name of the American Silver Producers' Association at a meeting held in Salt Lake City September 6 to 8, 1924.

Nealy all of the silver producers, both large and small, in the United States, and some in Mexico, became members of this organization, the total membership representing a total of nearly one hundred million ounces of silver per annum. What has the association done, and what could it do, to promote the interest of the silver producer? Not much, it is true, because silver is nothing but a world commodity, and is subject to the same old law of supply and demand, like any other basic commodity, such as copper, lead, zinc, rubber, coffee, and wheat. Overproduction of silver is primarily the cause of the low price, and this has been aggravated by the fact that India, formerly the largest consumer of silver, is now a seller of that metal.

One of the first activities of the American Silver Producers' Association, and in fact its major one, was the alliance made with the Sterling Silversmiths' Guild of America to undertake an extensive, nation-wide advertising campaign, largely in the better class magazines, to popularize and increase the sales of sterling silverware. It was agreed that the two organizations, on a 50-50 basis, should spend $300,000 for this purpose in a four-year program beginning in 1925. In 1927 an additional $75,000 was appropriated, bringing the total up to $375,000, of which the American Silver Producers' Association contributed one-half, or $187,500.

At the end of 1928, the four-year program having been completed, the Silversmiths' Guild decided to appropriate $200,000 more for an intensive advertising campaign confined to three separate sections of the country during the year 1929. Of this amount the Silver Producers contributed $10,000 over and above what they had previously appropriated, so that for the five-year period ending in 1929 a total of $575,000 was appropriated for this advertising program, of which the Silver Producers contributed $197,500.

The campaign was eminently successful in that the sales of sterling silverware were largely increased, resulting in material benefit to the manufacturers comprising the Silversmiths' Guild. But did this advertising campaign have any effect on the price of silver? No, it did not. In fact, the price declined during this period, and hence from the standpoint of the silver producer it was merely a noble but futile gesture. We live and learn, but all human experience is costly. Even if we assume that the increased sales of sterling silverware would absorb an additional 10,000,000 ounces of our domestic production it would be but a small fraction of the world's production, and therefore it could have no effect on the world price.

Conditions in China

UP to 1926, when India went to a gold standard, India and China had been the great dumping ground for silver, those two countries alone absorbing year after year for generations approximately 70 percent of the total world's production. Then in 1926, almost overnight, India, instead of a purchaser, became a heavy seller and began to get rid of her immense stocks of silver. To discourage further shipments of silver into India early in this year the Indian Government placed an import duty on silver amounting to about 9 cents per ounce. This left China practically the only nation in the world not on a gold standard, and thus China has become the only major silver market, and continues to absorb a large part of the world production, notwithstanding the extremely unsettled conditions prevailing there. Due to civil warfare, revolutions and the activities of roving bands of bandits, the Nationalist Government controls only a relatively small area, while the remainder of the country is in the control of the four revolutionary war lords. In consequence chaotic conditions prevail over the greater part of China. Business, except in the vicinity of the treaty ports, is at a standstill, the great mass of the people are unemployed and are forced to attach themselves to one or

another of the various armies, or to become bandits, in order to get food and clothing for themselves and families.

In China, as well as in India, silver always has been, and is now, the only money the people know. They can not get gold, and they will not use paper money, so silver is the only circulating medium representing value. Their savings, if any, is in silver in some form, such as bangles, bracelets, and other articles with which they are accustomed to adorn their women. Much of the silver is buried for safekeeping, but for some time past large quantities of this privately owned silver has been flowing to the banks in Shanghai and other treaty ports to keep it out of the hands of the war lords and bandits. Thus the banks at Shanghai have accumulated immense stocks, estimated in 1929 to be about 200,000,000 ounces. But this silver is serving no useful purpose. It is not in circulation. This amount of silver, large as it is, is nothing in comparison with what the Chinese people could and would use once order were restored in that unhappy country so that the silver could move safely into the interior.

Because of the demonetization of silver and the extremely low price to which silver has fallen, the Chinese people have become impoverished, their small individual savings of silver depreciated in value 50 percent, and their purchasing power correspondingly reduced, thus adding to the tragedy of the whole situation.

Senate Sub-Committee Investigation

WHAT, if anything, can be done to alleviate this situation is a problem which is now under investigation by a sub-committee of the Senate Committee on Foreign Relations. This sub-committee consists of Senator Pittman, of Nevada, chairman, and Senators Swanson, of Virginia, Johnson, of California, Shipstead, of Minnesota, and Vandenberg, of Michigan. The purpose of this committee is "to examine and study:

"(a) Stipulations relating to commerce in existing treaties of the United States and other governments with the Republic of China.

"(b) Conditions that may affect our commerce and trade with China."

The committee was authorized to hold hearings in various parts of the country, to take the testimony of exporters and men familiar with Chinese conditions, with a view to determining the cause or causes of the decline in our export trade with China.

The first hearing was held in Washington, D. C., on August 8, at which Mr. Chas. K. Moser, chief of the Far Eastern Section of the Division of Regional Information, Department of Commerce, testified.

The record of this hearing, giving Mr. Moser's testimony, which was quite voluminous and included various documents giving detailed and most interesting information on Chinese conditions, has been printed in pamphlet form, entitled "Hearings Before a Sub-Committee of the Committee on Foreign Relations, United States Senate, 71st Congress, 2nd Session, pursuant to S. Res. 256, Part 1."

Subsequent hearings of this committee were held in San Francisco, August 27th to 30th; in Los Angeles during the week of September 2d to 6th; and in Seattle on September 20th to 22d.

It was my privilege to attend the San Francisco and Seattle hearings at which many witnesses voluntarily testified, including exporters and economists familiar with our export trade with China. Much valuable information was brought out, all of which will be published later.

The opinion of these experts was practically unanimous that the decline in our export trade with China has been coincident with the decline in the price of silver, and that the decreased purchasing power of the Chinese people, due to this fall in silver prices, is one of the principal causes of our diminished exports.

A Possible Remedy

ALL are agreed that the first step is the pacification of China, not by military intervention but by peaceful and helpful means on the part of the principal treaty powers, which, through financial assistance offered to the Nationalist Government, would enable that government to either defeat or to make attractive overtures to the several war lords, to the end that all internal warfare shall cease, and thus permit the great mass of the people, now compelled to fight for a living, to return to their homes and engage in gainful occupations.

The plan most discussed, and which seemed to meet with the most favor, was for the United States, together with other treaty powers having commercial relations with China, to make a joint loan to the Nationalist Government, which is the government in China now recognized by these powers, to enable that government to effectually control the situation. It is proposed that this loan should be in silver, say, 500,000,000 ounces, or as much thereof as may be needed, to be delivered, perhaps already coined, as and when called for.

As security for this loan, it was suggested that a commission should be appointed by the treaty powers to supervise the collection and administration of the Chinese customs, and perhaps of the salt tax, with, of course, the full approval of the Nationalist Government. Inasmuch as these customs and taxes are now hypothecated for other loans, it would be necessary to guarantee the present outstanding loans in order to release the custom collections and other taxes, but a small part of which now reach the government because of the graft attached to the present system.

Of course, there are an infinite number of difficulties and obstacles which must be overcome before such a plan could be made operative. But once order was restored in China, the government could put the people to work building roads and in other constructive enterprises, and in the development of China's natural resources. The silver now stored in Shanghai would begin to flow back into the interior, and with the people engaged in useful occupations there would soon be created a demand for more silver, which would thus furnish an almost unlimited market for the silver-producing countries. With this increased demand there would naturally follow an increase in the price. The increased price would restore the purchasing power of the people and incidentally their ability to buy our goods.

This is a pretty rosy picture, it is true, but it may not be impossible of accomplishment. If the plan should at least bring about peace in China, it is worth the effort to put it into effect.

If Senator Pittman's committee should decide to recommend some such plan, the procedure will be for this committee to ask the Senate Committee on Foreign Relations to report out to the full Senate a resolution requesting the President to call a conference of the principal treaty powers to consider putting into effect the plan recommended by the Senate sub-committee.

As to the future for silver, we can only guess, because nobody knows. Legislation by the United States alone, favorable to silver, appears to be hopeless to look for at this time. Increase in price can only come about by increased demand and consumption. New uses for silver may be found; increased use in the arts may be brought about; but, after all, the most important factor in this situation is pacification of China, which would immediately create a demand for more silver.

Of equal importance is the possibility of the nations of the world returning to the greater use of silver for subsidiary coinage. Furthermore, there is always the remote possibility that sooner or later, by international agreement, the nations of the world will restore silver as a money metal at some fixed ratio with respect to gold.

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The White House from the Zero Milestone

Legislative Review

A HOST of legislative issues, old and new, will face Congress when it reconvenes on Monday, December 1. These will comprise a group of legislative proposals coming over uncompleted from the previous session which ended on July 3 last, and new proposals which have developed since that time. The forthcoming session, however, will be brief, ending on March 4, 1931, affording three months for the disposition of many knotty problems to come before the national legislative body. Preference is usually given in these short sessions, which occur every two years, to the bills making appropriations for the Government departments during the year beginning July 1, 1931, although opportunity will be found for discussion and probably action on some of the more pressing questions.

President Hoover has recently thrown out suggestions, in public addresses, for legislation looking to revision of the antitrust laws so as to put an end to the destructive competition in the bituminous coal industry; for amendment of the transportation act of 1920 and for repeal of the tax on capital gains. Senator Oddie, of Nevada, chairman of the Senate Committee on Mines and Mining, has announced that he will sponsor legislation to forbid the importation of manganese, coal and other products from Russia on the ground that they are being dumped into the United States, and Senator Nye, of North Dakota, chairman of the Senate Public Lands Committee, has indicated that he will call for an investigation of charges that the Interior Department has favored large oil interests in the disposition of oil shale land claims in the West.

Reports may be expected from numerous commissions, both Presidential and Congressional, which have been investigating such subjects as the administration and the conservation of the public domain, and the attempt of Socialists to undermine the Government. The Joint Congressional Committee on Internal Revenue Taxation is expected to grant hearings early in December on proposals to amend the mine depletion law so as to allow depletion deductions on the percentage basis.

Speaking at Cleveland before the convention of the American Bankers' Association recently, President Hoover suggested an investigation of the tax on capital gains, intimating that it "directly encourages inflation by strangling the free movement of land and securities." This has been interpreted as favoring the repeal of this tax. The President also suggested that there should be revision of certain features of the transportation act affecting the railroads, but did not elaborate on the subject.

Coal Relief

While not mentioning specifically the anti-trust laws, it was inferred from a later speech delivered by the President before the convention of the American Federation of Labor at Boston that he favored their amendment when he recommended "reduction of destructive competition in the bituminous coal industry through revision of our regulatory laws." The President spoke at greater length on this question than he did on the tax and railroad situation. After discussing the readjustment of industry and labor caused by new discoveries and inventions, the President on this point said:

"It is this process of readjustment that partly causes our present difficulties in the bituminous-coal industry. In that industry the encroachments of electrical power, of natural gas, of improvements in consumption, have operated to slow down the annual demand from its high peak, leaving a most excessive production capacity. At the same time, the introduction of labor-saving devices has decreased the demand for mine labor. In addition to its other difficulties must be counted the effect of the multitude of 6,000 independent mine owners among 7,000 mines, which has resulted in destructive competition and final breakdown of wages.

"All these conditions have culminated in a demoralization of the industry and a depth of human misery in some sections which is wholly out of place in our American system. The situation has been under investigation of our Government departments, by Congress, together with commissions and committees of one sort or another, for the past 10 years. The facts are known. One key to solution seems to me to lie in reduction of this destructive competition. It certainly is not the purpose of our competitive system that it should produce a competition which destroys stability in an industry and reduces to poverty all those within it. Its purpose is rather to maintain that degree of competition which induces progress and protects the consumer. If our regulatory laws be at fault they should be revised."

The reference to "human misery" in certain sections of the bituminous industry may have been prompted by a recent interview the President had at the White House with John L. Lewis, president of the United Mine Workers of America, who has frequently referred to the plight of the miners.

It is probable that these views will be re-stated by the President in his message to Congress outlining his legislative recommendations, which is expected to be laid before Congress on December 2.

The House Committee on Ways and Means will consider the Russian import

situation, having before it a bill introduced by Representative Brumm, of Pennsylvania, representing part of the anthracite producing district, to bar imports of Russian anthracite on the ground that they are produced by convict labor. The committee heard Mr. Brumm in favor of his legislation before the close of the last session, and called on various Government departments for reports on the situation, which will no doubt be available when the new session opens. The issue, in a broader form, will be laid before the Senate by Senator Oddie, who has announced that he will introduce a bill when Congress re-convenes to prohibit the entry into the United States of manganese, coal, lumber and other products from Russia. He charges that Russia is dumping these products into the United States "regardless of price and absorbing production losses through the enslavement of the Russian peasantry and the inflation of its currency." The Senator declares that "drastic legislation in the farm of an embargo has become necessary in order to protect American industry."

Russian Imports

The movement to exclude these Russian imports will have the active support of a group of representatives of the industries affected by the foreign products, recently organized in New York. It will include representatives of the American Manganese Producers' Association, the Anthracite Institute, the Anaconda Copper Mining Company, the National Lumber Manufacturers Association, and the Butte Copper and Zinc Company.

Hearings are expected to begin before a commission authorized at the recent session to consider plans to conscript industry as well as man-power in future wars. The commission has until December, 1931, to make its report and consists of four Senators—Reed (Pa.), Vandenberg (Mich.), Robinson (Ark.), and Swanson (Va.)! four Representatives—Hadley (Wash.), Holaday (Ill.), Collins (Miss.), and McSwain (S. C.); and six Cabinet officers—the Secretaries of War, Navy, Agriculture, Commerce, Labor, and Justice.

For the purpose of preventing accidents to dirigible balloons similar to the recent catastrophe in Europe, Representative Britten, of Illinois, chairman of the House Naval Committee, will favor legislation to permit the exportation of helium. At present, helium exports are forbidden by law on the theory of conserving the supply for American use. Since the law was passed the Bureau of Mines has been able to produce more helium than is needed by the military and naval services.

One of the hold-over pieces of legislation to receive attention will be the matter of disposition of the Muscle Shoals, Ala., nitrate and power project. At the last session the Senate passed a bill for Government operation of the properties, while the House adopted a substitute bill providing for its lease to private interests. The conference committee representing both Houses were in deadlock at the last session, and efforts will be made in the new session to break the impasse and dispose of this much controverted legislation which has been pending for more than 10 years. Doubt has been expressed, however, by Speaker Longworth of the House that Congress will be able to dispose of this legislation at the coming meeting on the ground of lack of time to consider this and other controverted legislation.

Another legislative proposal that has been pending for some time is also doubtful of completion at the forthcoming meeting, in the opinion of the House Speaker. This matter relates to railroad consolidations. Some time ago Congress authorized the Interstate Commerce Commission to bring about consolidations of the railway properties, and then developed the question of the inter-financial relationships in this industry. The Senate has passed a resolution requesting the Commission to defer these consolidations pending investigations into these financial questions, and the resolution is before the House on report of its Interstate Commerce Committee, which is conducting an investigation as to the intercorporate financial relations of the railroads.

Mining Bills

Both Houses have on their calendars and in their committes a number of mining proposals. On the House calendar, subject to action, are bills to establish an assay office at Dahlonega, Ga.; to create a division of safety in the Department of Labor; for the conservation and operation of naval petroleum and oil shale reserves by the Navy; and for the application of the immigration quota restriction law to Mexico and other countries of the Western Hemisphere.

The silver question, which has developed to an acute stage due to the low price of the metal, will engage the attention of the Senate at least. Senator King, of Utah, has pending and can call up at any time a resolution proposing an international conference to consider means of stabilizing the price of silver at a higher level and the Senate Judiciary Committee may report legislation as a result of inquiries by a subcommittee headed by Senator Pittman, of Nevada, which has considered the matter from the standpoint of the Oriental trade situation and stabilizing conditions in China. The Senator has tentatively proposed that the United States loan a large amount of silver to China for its industrial development, which he believes will tend to stabilize the price by permitting the increased use of silver in trade.

President Hoover's Commission on Conservation and Administration of the Public Domain has been making a personal investigation of the land situation in the Western States and may submit reports and recommendations to the President, which he is expected to in turn forward to Congress for action should they involve legislative enactments considered advisable by the commission and the President.

Senator Norris, of Nebraska, will attempt to have the Senate consider early in the session the bill of Senator Shipstead, of Minnesota, to forbid the issuance of court injunctions in labor disputes. This bill is on the Senate calendar on an adverse report from the Senate Judiciary Committee.

Alaskan Railroad

Another commission which may be heard from is one headed by Senator Howell, of Nebraska, which during the recess has visited Alaska on an investigation of the operation of the Alaskan Railroad, a Government-operated utility.

Report is also expected from a House committee, headed by Representative Fish, of New York, which has conducted hearings from coast to coast as to the attempts of Communists to break down the Government. Among those testifying in these hearings, which were held at New York, Chicago and at Pacific Coast cities, were representatives of the United Mine Workers of America who spoke of the work of radicals among the miners.

A report is expected from the Department of Justice in response to a resolution of Senator Wheeler, of Montana, as to whether oil and gas corporations and associations in that state are violating the anti-trust laws by fixing prices or by other practices.

Hearings are slated for December 9 before the Joint Congressional Committee on Internal Revenue Taxation as to the application of a percentage basis to depletion allowances in the mining industry. The investigating division submitted a preliminary report on the question more than a year ago, and the forthcoming hearing is expected to bring forward the views of the mining industry and the Treasury Department, which administers the law through its Internal Revenue Bureau.

Membership Changes

Several new members will appear in both the Senate and House at the December session, as the result of elections in November, to fill the unexpired terms of deceased members or those serving under temporary appointments by state governors, while next March a larger number of new members will enter Con-

gress for the regular terms beginning on that date, likewise as a result of these elections. Newly elected Senators will take their seats in December from Delaware, Kansas, Kentucky, New Jersey, Ohio, Pennsylvania, Tennessee and Wyoming to replace those serving by appointment. Some of the sitting members are likely to remain, while a number of the others will be retired. Those to be replaced will be Senators Baird, of New Jersey; Sullivan, of Wyoming, and Grundy, of Pennsylvania, as they were either not candidates for election or were defeated in the primaries. Sitting members who were candidates in the November elections to retain their seats were Senators Brock, of Tennessee, for the term ending March 4 next; Hastings, of Delaware, and Robsion, of Kentucky, for the term ending March 4 next and the six-year term immediately following; and Allen, of Kansas and McCulloch, of Ohio, for the term ending March 4, 1933. All of these sitting members had opponents in the November election, among them former Senator Bayard, of Delaware. Former Ambassador to Mexico Dwight F. Morrow was the leading candidate to succeed Senator Baird. Senator Sullivan's seat was sought by Former Governor Robert D. Carey, of Wyoming, and that of Senator Grundy by Secretary of Labor James J. Davis. In the Ohio Senate race former Representative Robert J. Bulkley, of Cleveland, was seeking to defeat Senator McCulloch. For the six-year term from Tennessee beginning March 4 next, the leading candidate was Representative Cordell Hull, long a member of the House and an authority on the tariff and tax laws. Senators who will be retired after March 4 include Senators Blease, of South Carolina; Deneen, of Illinois; Gillett, of Massachusetts; Goff, of West Virginia; Gould, of Maine; Phipps, of Colorado; Ransdell, of Louisiana; Simmons, of North Carolina.

In the House new members will take seats at the December session caused by the death or resignation of several members since the July session. Two of these will come from North Carolina, succeeding the late Representatives W. C. Hammer and C. M. Stedman, who died recently, and to succeed Representative D. H. Kincheloe, of Kentucky, who resigned to become a judge of the Customs Court by appointment of the President. Hinton James is a candidate for the balance of the term of Representative Hammer ending March 4 next, while Walter Lambeth seeks the regular two-year term immediately following. On March 4 other members who were defeated for reelection will be replaced by new ones chosen in the November election.

Committee Changes

Practically every important committee of the Senate and House will experience a shake-up in its personnel as a result of changes in the membership of Congress. Some of these changes will take effect in December and the balance in March. Members who will be retired from Senate committees are as follows:

Appropriations—Phipps, of Colorado.

Banking and Currency—Phipps, of Colorado; Baird, of New Jersey, and Grundy, of Pennsylvania.

Commerce—Gould, of Maine; Deneen, of Illinois; Ransdell, of Louisiana, and Simmons, of North Carolina.

Labor—Phipps, of Colorado; Gillett, of Massachusetts, and Baird, of New Jersey.

Finance—Deneen, of Illinois, and Simmons, of North Carolina.

Immigration—Gould, of Maine, chairman, and Blease, of South Carolina. Senator Hatfield, of West Virginia, will be in line for the chairmanship of this committee when Senator Gould retires next March. Senator Hatfield is not at present the chairman of any committee, while the other ranking members of the Committee are chairmen of committees as follows and are not likely to vacate them for the Immigration chairmanship: Johnson, of California, chairman of the Commerce Committee, who was formerly chairman of the Immigration group; Keyes, of New Hampshire, chairman of Public Buildings; Reed, of Pennsylvania, chairman of the Military Committee; Nye, of North Dakota, chairman of Public Lands; and Watson, of Indiana, Republican leader, who does not hold a chairmanship by virtue of his duties in this important position.

Interstate Commerce—Goff, of West Virginia.

Judiciary—Dineen, of Illinois, and Gillett, of Massachusetts.

Manufactures—Deneen, of Illinois, and Grundy, of Pennsylvania.

Military Affairs—Baird, of New Jersey; Sullivan, of Wyoming, and Blease, of South Carolina.

Mines and Mining—Goff, of West Virginia.

Naval Affairs—Sullivan, of Wyoming, and Grundy, of Pennsylvania.

House Committees

The following members will retire from committees of the House:

Appropriations—Cramton, of Michigan, and Dickinson, of Iowa.

Banking and Currency—Fort, of New Jersey.

Coinage—Oldfield, of Arkansas, and Sutherland, of Alaska. A new member will be named to succeed the late Representative Lampert, of Wisconsin.

Foreign Affairs—Moore, of Virginia. A new member will be appointed to succeed the late Representative Stedman, of North Carolina, while a new Republican member will be appointed due to the promotion of Representative Temple, of Pennsylvania, to the chairmanship, succeeding the late Representative Porter, of Pennsylvania.

Immigration—Box, of Texas.

Indian Affairs—Sproul, of Kansas, and Sutherland, of Alaska. A new Democratic member will be appointed to fill a vacancy.

Judiciary—A new member succeeding the late Representative Hammer, of North Carolina.

Merchant Marine—Representative Free, of California, is likely to be the new chairman succeeding Representative White, of Maine, who has been elected Senator. While Representative Lehlbach, of New Jersey, is in line for the chairmanship, he is already chairman of another committee which he is not likely to exchange. Delegate Sutherland, of Alaska, will retire from this committee, while a new Democratic member will be named to fill a vacancy.

Military Affairs—Representative Fisher, of Tennessee, and a new Republican member to fill a vacancy.

Mines and Mining—Representative Sproul, of Kansas, who will retire as he was an unsuccessful candidate for the Senate, and Delegate Sutherland, of Alaska. Representative Manlove, of Missouri, is likely to be the new chairman, and a new Republican member will be named to fill a vacancy.

Naval Affairs—Representatives Miller, of Washington, and McCormick, of Illinois.

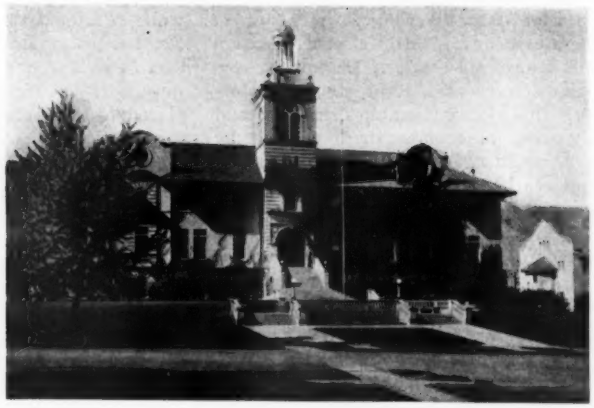
Patents—A new member will be named to succeed the late Representative Lampert, of Wisconsin.

Rivers and Harbors—Representatives Dempsey, of New York, chairman; Michaelson, of Illinois; Hudson, of Michigan, and O'Connor, of Louisiana. Representative Freeman, of Connecticut, is in line for the chairmanship.

Ways and Means—Representative Hull, of Tennessee.

Labor—A new Democratic member to fill a vacancy.

INDUSTRIAL SAFETY TRAINING at a mining school*



Guggenheim Hall, main building, the Colorado School of Mines

By **E. H. DENNY** † *and* **G. M. KINTZ** ‡

ALTHOUGH some engineering colleges recognize the importance of instructing young engineers in industrial safety, the different institutions handle this instruction in various ways. It is believed that a recent industrial safety course, conducted at the Colorado School of Mines through the cooperation of this school and the Bureau of Mines, U. S. Department of Commerce, presents some unusual features that are of interest to other schools and to the mining public.

ACKNOWLEDGMENT

The writers wish to acknowledge with thanks the cooperation and assistance rendered by President Coolbaugh, Professor Read, and Professor Boatright of the Colorado School of Mines, in making this safety course possible and successful; thanks are also due the Public Service Company of Colorado, the Hercules Powder Company, and the American La France and Foamite Industries, Inc., for the lectures contributed by their safety engineers.

DESCRIPTION OF COURSE

The industrial safety course at the Colorado School of Mines, Golden, Colo., covered a two-week period during the spring of 1930 and was supplementary to any discussion of and reference to safety incident to any of the other school courses. One-half of the junior and senior students took this industrial safety course; taking one-half of the upper-class men thus each year, while the other half are completing required field trips, insures that all graduating students will have some realization of the importance and principles of safety.

The men enrolled for the industrial safety course included students of mining, petroleum engineering, geology, metallurgy, and geophysics. Any lecture given, therefore, to the entire group had to be general enough to be of value to all, it being borne in mind also that the graduating students might eventually engage in other lines of engineering work than that indicated by their graduating degree. The preponderance of mining and petroleum students in the group seemed, however, to justify special attention to mining and oil safety.

After some study of this situation by the school authorities and the authors of this paper the following plan was agreed upon:

(1) Emphasis should be placed during all safety lectures and discussions upon the economic importance of safety in industry.

(2) The course should consist of: (1) six general safety lectures of two hours each to be attended by all students enrolled; (2) five petroleum safety lectures of two hours each; (3) five evening lectures and practice periods in first aid to the injured—to be attended by all of the enrolled students but classes to be split in half for better work and the students required to attend on alternate nights for a 10-day period; and (4) five morning or afternoon classes of four hours each for the mining students in the study and use of mine rescue apparatus and accessories and in principles of mine rescue and mine fire-fighting work. Inasmuch as only 10 students could be handled in a class on account of the 10 mine-rescue apparatus available, the approximately 30 mining students had to be divided into three groups working on different days.

(3) Typewritten notes were required to be handed in on all general safety and petroleum-safety lectures. It was also required that one article on safety be read and briefly abstracted with each lecture, a number of publications of the Bureau of Mines, periodicals, and safety rules of companies, and publications of the National Safety Council to be made available in the school library for this purpose.

(4) Five safety engineers from several Denver industries gave lectures on the various phases of industrial safety with which they were particularly familiar.

The courses as conducted in accordance with the above plan were scheduled as shown above.

FIRST-AID COURSE

The first-aid course for all students is the same course as that given by the Bureau of Mines during the fiscal year 1930, to more than 112,000 persons in the mining and petroleum industries and has been given to all upper classmen annually at the Colorado School of Mines for a number of years. In five evening lessons the control of bleeding, artificial resuscitation, the bandaging of wounds, the splinting of fractures, and the treatment of shock are taught through lecture, demonstration, and actual application of bandages and splints by class members. It is considered that such first-aid training not only promotes the saving of life and minimizing of injury by prompt and effective treatment of an injured person when an accident occurs, but also tends to prevent accidents through the predisposition of a person trained in first aid to think and to act safely.

* Reprinted from U. S. Bureau of Mines, Information Circular 6349.
† District Engineer, U. S. Bureau of Mines.
‡ Associate Mining Engineer, U. S. Bureau of Mines.

SCHEDULE—INDUSTRIAL SAFETY CLASSES

	A. M. 8 to 12 Experimental Plant	A. M. 9 to 11 Straton Hall	P. M. 1 to 5 Experimental Plant	P. M. 7 Straton Hall
Monday		General Safety	Mine Rescue (a)	First Aid (a)
Tuesday	Mine Rescue (b)	Petroleum Safety	Mine Rescue (c)	First Aid (b)
Wednesday		General Safety	Mine Rescue (a)	First Aid (a)
Thursday	Mine Rescue (b)	Petroleum Safety	Mine Rescue (c)	First Aid (b)
Friday		General Safety	Mine Rescue (a)	First Aid (a)
Saturday	Mine Rescue (b)	Petroleum Safety		
Monday		General Safety	Mine Rescue (c)	First Aid (b)
Tuesday	Mine Rescue (b)	Petroleum Safety	Mine Rescue (a)	First Aid (a)
Wednesday		General Safety	Mine Rescue (c)	First Aid (b)
Thursday	Mine Rescue (b)	Petroleum Safety	Mine Rescue (a)	First Aid (a)
Friday		General Safety	Mine Rescue (c)	First Aid (b)

Mine Rescue Course

The mine rescue course given to 30 mining students was also a standard course of the Bureau of Mines. The students were required to wear self-contained oxygen breathing apparatus and perform work in irrespirable gases; and they studied the construction and operation of this apparatus, and the limitations of its use. They also studied organization and methods for combatting mine fires and for mine recovery after an explosion or a fire. The underground work was performed in some drifts driven some years ago by students in a hillside near Golden.

General Safety Course

The lectures in the general safety course covered briefly the subjects listed below and a large optional list of references furnished additional information. The reading and abstracting of portions of any six of these references were required.

Outline of General Safety Course

First Lecture:

Importance of safety to the nation and the individual.

The purpose of the United States Bureau of Mines; details of its work toward safety and efficiency in the mineral industries.

Accident statistics: (a) by whom compiled and where available; (b) frequency and severity bases; (c) lost time accidents, fatalities, permanent disabilities, non-injury accidents; (d) comparative accident experience of various industries.

Economic losses in industry due to accidents: (a) over $2,000,000,000 annual loss to employer, employe, and public through accidents; (b) direct and indirect costs of accidents to employers.

Compensation laws.

Comparison of mine accident rates in the United States and Europe.

Organization—purpose and description of various company safety organizations.

Safety education of officials and employes.

Discipline.

Safety records of companies having good safety records showing financial saving to companies.

Second Lecture:

Electrical safety (by officials of an electric company): (a) handling of disconnecting switches; (b) the installation and removal of station grounds; (c) safety practice in servicing a line; (d) fuses; (e) electrical fire extinguishment; (f) types of men desirable for electrical work; (g) types of insulating material; (h) tests of insulating material for safety; (i) precautions in the use and storage of rubber insulating material.

Third Lecture:

Mine and industrial gases:

Normal air.

Oxygen—Properties and physiological effects.

Nitrogen—Properties, physiological effects and detection.

Carbon dioxide—Properties, physiological effects and detection.

Hydrogen sulphide—Properties, physiological effects and detection.

Carbon monoxide—Properties, physiological effects and detection.

Methane—Properties, physiological effects and detection.

Oxides of Nitrogen—Properties, physiological effects and detection.

Showing of gas detectors.

Discussion of gas occurrences in mines and in caisson work.

Fourth Lecture:

Safety in the use of explosives (by an explosives engineer of an explosives company):

Low-freezing explosives.

How to thaw explosives.

"Don'ts" in handling explosives.

Storage of explosives.

Permissible explosives.

Use of explosives in quarries.

Use of explosives in mines.

Motion pictures on use of explosives.

Fifth Lecture:

Humidity and its relation to safety and efficiency when accompanied by high temperatures.

Mine ventilation.

Gasoline vapor.

Protection against gases: (a) hose mask, use and limitations; (b) gas mask, use and limitations; (c) oxygen breathing apparatus, use and limitations.

Showing of masks and oxygen apparatus.

Mine accidents: (a) accidents from falls of rock, roof, coal, ore, and methods for their avoidance; discussion of and lessons from various mine explosions.

Permissible electrical equipment.

Mine lighting—permissible electric lamps.

Safe clothing (hats, shoes, goggles, etc.).

Sixth Lecture:

Mechanical safeguards: Importance and principles of belts and pulleys.

Ladders.

Safety in the use of hand tools.

Safety in the use of jacks.

Fire and prevention extinguishment: (a) fire extinguishers; (b) automatic sprinkling systems; (c) fire hose and hydrants; (d) chemical engines.

Underground fires: (a) importance of organization and equipment; (b) sealing of fires in gassy mines.

Conclusion—desire of U. S. Bureau of Mines to cooperate with the mining industry.

Petroleum Safety Course

The petroleum safety course was given to some 30 students in petroleum engineering. The course included some subjects touched upon in the general safety course which were considered in much more detail in the petroleum course. An outline of the lectures given is as follows:

First Lecture:

Gases found in the petroleum industry:

Normal air.

Oxygen: (a) effects of oxygen deficiency; (b) extinguishment of various flames by oxygen deficiency.

Nitrogen.

Carbon dioxide: (a) effect on man; (b) determination of carbon dioxide with Orsat apparatus.

Helium.

Petroleum and gasoline vapors: (a) properties; (b) detection of combustible gases and protection against them; (c) protection against oil vapors; (d) treatment for poisoning by petroleum and gasoline vapors.

Hydrogen sulphide: (a) properties and physiological effects; (b) treatment of hydrogen sulphide poisoning; (c) detection of hydrogen sulphide; (d) protection against hydrogen sulphide.

Carbon monoxide: (a) detection and types of detectors.

Second Lecture:

Sulphur dioxide: (a) properties and physiological effects; (b) treatment of sulphur dioxide poisoning; (c) protection against sulphur dioxide.

Chlorine: (a) properties and physiological effects; (b) treatment of chlorine poisoning; (c) safe handling of chlorine tanks; (d) protection against chlorine.

Natural gas (by an official of a gas company): (a) general rules for handling; (b) "bagging off" of openings in mains; (c) properties of natural gas; (d) the gas detector—demonstration and principles; (e) rules when working in manholes; (f) protection in excavations; (g) repair work on private property; (h) safety appliances in use of gas in homes.

Third Lecture:

Oxides of nitrogen: (a) properties and physiological effects, also occurrence; (b) protection against.

Carbon tetrachloride: (a) dangers of, when used on a fire in confined spaces.

Types of combustible gas detectors: (a) flame safety lamp—demonstration; (b) "Burrell" methane detector—demonstration; (c) "Martienssen" methane detector; (d) "J. W." methane detector; (e) "Jones" methane detector; (f) detector.

Sampling of gases.

Protection against gases: (a) hose mask with blower; (b) types of gas mask canisters; (c) limitations of gas masks.

Fourth Lecture:

Safe practice in pulling wells: (a) inspection; (b) precautions in work.

Lighting: (a) importance of good illumination; (b) dangers of various types of lighting.

Fire protection and extinguishment (by a representative of a fire extinguisher company): (a) essentials of fire protection; (b) types of fire extinguishers; (c) principles and action of foam extinguishers.

Fifth Lecture:

Oil fires: Causes.

Fighting oil fires: (a) tank fires; (b) rig fires.

Cleaning oil tanks: Precautions in entering tanks.

Precautions with electrical equipment about tanks and refineries:

Types of switches, motors, and lights, to use.

Conduit wiring.

Grounding of electrical equipment.

Tank-gaging precautions.

Static electricity hazards.

Publications for Study with Safety Course

Each student was required to read and abstract portions of any six of certain assigned publications in the general safety course and of any five of certain assigned publications in the petroleum safety course. Lists of these publications follow:

Publications for Reference in General Safety Course

Annual Report of the Director of the Bureau of Mines for the year ending June 30, 1929.—Summary of general fields of work.

Bulletin 310—U. S. Bureau of Mines—Metal Mine Accidents in the U. S. 1927—Causes of Accidents, page 2; Method of estimating lost time from accidents, pages 57-58; accidents in mineral industries frequency rates, page 91.

Workmen's compensation act of Colorado—pages 20-35, section 50 to section 88.

Bulletin 293—U. S. Bureau of Mines—Coal Mine Fatalities in the United States: 1927—Defects of tonnage basis for accident statistics; bottom page 1 to page 2, inclusive.

Circular 6166—U. S. Bureau of Mines—Accident Cost and Mine Safety.

Circular 6045—U. S. Bureau of Mines—Coal Mine Safety Organization.

Practical Accident Prevention—J. R. Davis—U. S. Gypsum Company.

Miners' Circular 33—U. S. Bureau of Mines—Mine Gases and Methods for Their Detection.

Technical Paper 373—U. S. Bureau of Mines—The Pyrotannic Acid Method for the Quantitative Determination of Carbon Monoxide in Blood and in Air.

Gases which occur in Metal Mines—A. I. M. E. Reprint.

Miners' Circular 35—U. S. Bureau of Mines—Protection Against Gases Encountered in Mines.

Serial 2847—U. S. Bureau of Mines "Prevention of Hydrogen Sulphide Poisoning in Handling and Refining High Sulphur Petroleums"; pages 13 to 15, inclusive.

Serial 2865—U. S. Bureau of Mines—Rock Strata Gases in the Cripple Creek District and Their Effect on Mining.

Serial 2944—U. S. Bureau of Mines—Accidents in Metal Mines Due to Falls of Men and Material.

Information Circular 6225—U. S. Bureau of Mines—Reducing Accidents from Falls of Roof in Coal Mines.

Information Circular 6242—Safety in Utah Coal Mines as Affected by Haulage.

Information Circular 6243—Safety in Connection with Haulage Practices in Alabama Coal Mines.

Technical Paper 464—U. S. Bureau of Mines—Coal Dust Explosibility Factors Indicated by Experimental Mine Investigations, 1911-1929.

Report of Investigations 2977—U. S. Bureau of Mines—Rock Dust Barriers for Coal Mines.

State of Oklahoma, Department of Labor, Bureau of Factory Inspection, Bulletin No. 11-A—Petroleum Industry Safety Standards, pages 3, 4, pages 7 to 14.

Public Service Company of Colorado—Safety Manual 1929.

Paper Delivered before Denver Colorado Safety Council by U. S. Bureau of Mines Employe entitled Danger to the Public from Carbon Monoxide.

National Safety News, October, 1929, article entitled Metal Mines Need Good Ventilation.

Information Circular 6073—U. S. Bureau of Mines—Fires and Fire Prevention in the Lake Superior Mines.

Information Circular 6076—U. S. Bureau of Mines—How Fires Start in Mines.

Bulletin 188—U. S. Bureau of Mines—Lessons from the Granite Mountain Shaft Fire, Butte.

Public Health Bulletin 186—Effect of Repeated Daily Exposure of Several Hours to Small Amounts of Automobile Exhaust Gas.

Technical Paper 355—U. S. Bureau of Mines—A Carbon Monoxide Recorder and Alarm.

Safe Practices Pamphlet No. 29—National Safety Council—Electrical Equipment in Industrial Plants.

Safe Practices Pamphlet No. 74—National Safety Council—Competition as an Aid in Promoting Accident Prevention.

Safe Practices Pamphlet 37—National Safety Council—Industrial Ventilation.

Safe Practices Pamphlet No. 39—National Safety Council—Machine Shop Machinery.

Miners' Circular 36—U. S. Bureau of Mines—Suggested Procedure in Sealing and Unsealing Mine Fires and in Recovery Operations.

Publications for Reference with Petroleum Safety Course

National Safety Council—Safe Practices Pamphlet No. 25—Acids and Caustics.

Transactions Vol. II of the National Safety Council, 1927—Petroleum Section. Pages 407-417.

1928 Transactions of the National Safety Council—Petroleum Section. Pages 429-436; pages 439-448.

U. S. Public Health Service Bulletin No. 163—The Use of Tetraethyl Lead Gasoline in its Relation to Public Health. Pages 108-111, 117-123.

Industrial Engineering, October, 1929. Pages 495-498, 520-523.

Oil Bulletin, February, 1928. Pages 145-147, 203.

Oil Bulletin, March, 1928. Pages 256, 307.

Oil Bulletin, April, 1928. Pages 409-411.

Oil Bulletin, June, 1928. Pages 581-585.

Oil Bulletin, October, 1928. Pages 1039-1045-1049.

Oil Bulletin, November, 1928. Pages 1155, 1161.

Oil Bulletin, December, 1928. Page 1256.

Oil Bulletin, July, 1929. Pages 685-709.

Bulletin 231—U. S. Bureau of Mines—Investigations of Toxic Gases from Mexican and other High Sulphur Petroleums and Products.

Bulletin 305—U. S. Bureau of Mines—Inspection and Testing of Mine Type Electrical Equipment for Permissibility. (Parts dealing with electrical equipment in gases.)

Information Circular 6064—U. S. Bureau of Mines—Accident Prevention Work of Midwest Refining Co.

Safety Rules and Instructions, Colorado Fuel and Iron Company, Minnequa Steel Works. Pages 17-21.

American Gas Association—Occupational Hazards of the Gas Industry.

Conclusion

Frequently it has been stated at various industrial operations that the graduate engineers given employment had little or no training along safety lines. This apparent lack of safety training is being remedied at some engineering schools, notably the Colorado School of Mines, by definite industrial safety courses required as a requisite to graduation.

It is felt that the importance of safety in industry can best be stressed to the undergraduate through continued insistence upon and demonstration of the economic importance of accident lessening and prevention.

The methods and procedure used in conducting the various safety classes at the Colorado School of Mines are subject to change to best meet the student needs; however, it is believed that any course in safety should emphasize from a cost standpoint the importance of safety education of officials and employes, the importance of discipline in lessening accidents, and the value of mechanical safeguards and a safety organization in preventing accidents. Also students should be trained in how properly to treat and care for injuries to themselves and others.

MILLING AND SMELTING OF LEAD AND ZINC

(*From page 799*)

Another subject covered in the critical thermodynamic survey of zinc which has been completed is the zinc blast furnace. The conditions of temperature and pressure under which liquid zinc can be produced by reduction of ZnO have been accurately calculated. It is found that by proper arrangement of the charge so that reduction proceeds by successive layers, liquid zinc may be produced at pressures not much above 10 atmospheres. A blast furnace utilizing this principle would have to be supplied with pure oxygen but is not beyond the realm of possible mechanical construction.

Pyrometallurgy of Lead

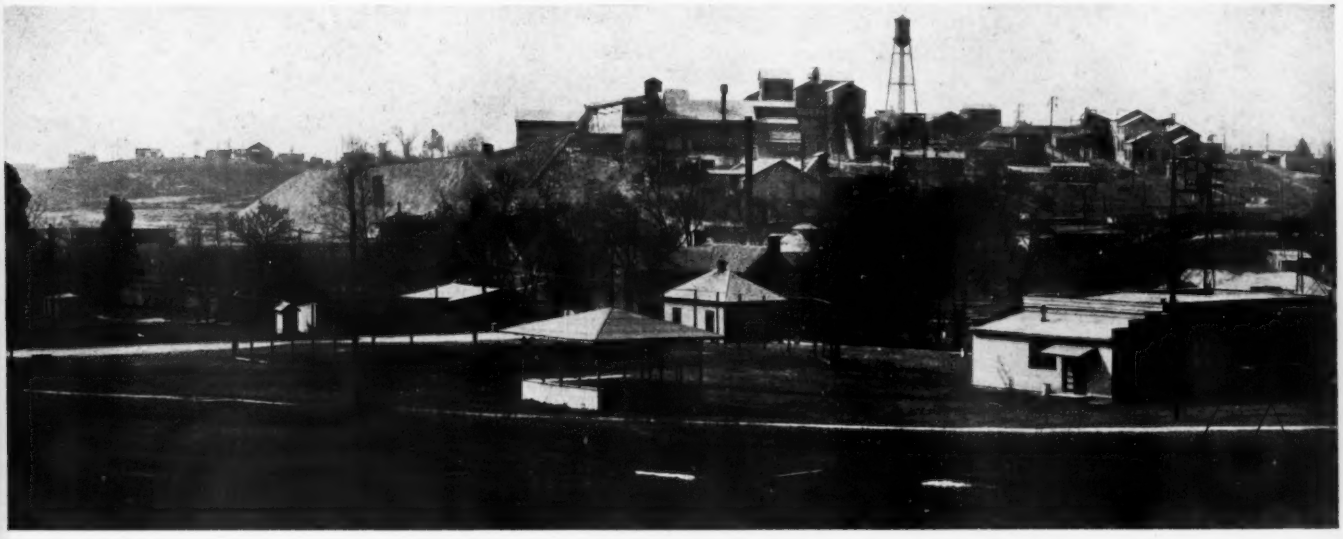
In its study of the lead blast furnace, the bureau is now going into the modifications that recent improvements in concentration have brought about by using a richer charge. The first study made of furnaces having feed of a lower grade to handle has been published recently in a series of five papers. They are entitled "Smelting in the Lead Blast Furnace," by G. L. Oldright, and issued as Bureau of Mines Reports of Investigations 2954, 2957, 2963, 2965 and 2966. In collecting data by experimental methods, particular attention has been given to just what was happening within the furnace to features that may be controlled in part by the smelter operator, although his dependence upon the ore-dresser has been pointed out. Experimental evidence has been gathered on the effect in the lead blast-furnace of using a feed of poorly mixed ingredients, of products that contain considerable sulphur, and of allowing the various steps of operation to fluctuate. The chemical forms in which the lead is present in the various steps of the operation have also been stressed, so that ideas might be obtained as to what steps of the process could be most profitably remedied.

A study of the lead-softening process which is also under way has already yielded interesting facts concerning the relations in the system $PbO \cdot Sb_2O_3$. It has been found that a compound is formed under certain conditions of temperature and composition which prevents volatilization of antimony.

American Zinc, Lead and Smelting Company

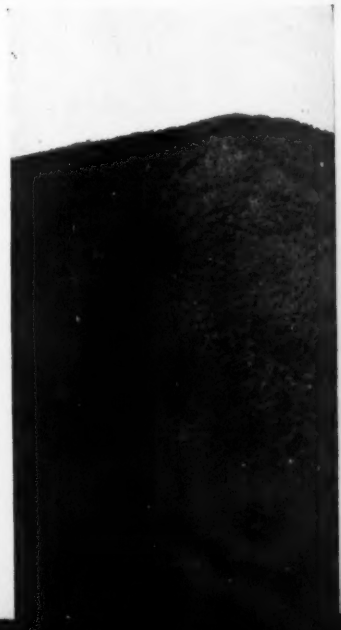
Cherokee Orchard, Gatlinburg Valley, Rocky Spur, Great Smoky Mountains National Park

1930



General View of Concentrating Plant of the American Zinc Company of Tennessee, Mascot, Tennessee

Looking West from the Chimneys, Great Smoky Mountains National Park



The photographs of the Great Smoky Mountains are published through the courtesy of Theodore Marvin of the Explosives Engineer, and are copyrighted by Thompson Bros., Knoxville, Tennessee

Looking Toward North Carolina From Sand Myrtle Top, Great Smoky Mountains National Park

Howard I. Young

President, American Zinc, Lead and Smelting Company

Across Huggins Hell Toward Cherokee Indian Reservation, Great Smoky Mountains National Park

History of the American Zinc, Lead and Smelting Company

By **Howard I. Young***

WHILE history shows that zinc as a metal was known in the Asiatic countries in the early middle ages, its use was extremely limited, even as late as the eighteenth century. The extraction of metallic zinc in a small way was being carried on in Europe toward the end of the eighteenth century, but was not considered of much commercial importance, and at the end of the next 25 years production had not been greatly extended. It was not until 50 years later, or until 1875, that the United States became an important producer of zinc and a factor in the world zinc industry.

The American Zinc, Lead & Smelting Company with a history extending over a period of 30 years is not exactly a newcomer in the zinc industry in the United States. Within that time notable advance has been made in the metallurgy of zinc; new and important sources have been developed, and new uses have been found, all of which has helped the United States maintain its position as a leader in the zinc industry in the world. The company is proud of any contribution it may have made, and the part it has taken toward advancing the position of this great basic metal industry.

The American Zinc, Lead & Smelting Company, as indicated by the name, was organized to mine and smelt zinc and lead ores. However, it is primarily a zinc producing company and its operations since organization have been confined largely to mining and smelting of this metal, with lead as an important secondary product. Its organization took place at a time when zinc was rapidly developing as a metal of great economic importance in this country, due to the increased output of zinc ores from the Joplin, Mo., District.

This field, now known as the Tri-State District (so called as it embraces parts of Missouri, Oklahoma and Kansas) became an important source for zinc about 1870. Up to that time the few smelters established in the Mississippi Valley had secured their ore supply from small mines in southeastern Missouri and southwestern Wisconsin. As transportation facilities were extended, more smelters were established and the output of zinc ore in the Joplin District increased rapidly, and by 1900 this field was supplying a large part of the zinc ore requirements of the United States.

Doubtless the methods of mining and milling in vogue in this field during the early days are unique in the history of mining in this country. As far back as 1850 mining for lead ore had been carried on in a small way, and while zinc ore was recognized it had no commercial value until railroads were extended into the mining fields and a market developed when smelters were established in the Mississippi Valley. Soon thereafter zinc mining became a thriving industry and by 1875 the district was supplying a very substantial tonnage of ore. A very interesting description of the methods employed, and the manner in which the mining business was conducted, has been written by a gentleman who is thoroughly familiar with the subject, having spent the greater part of his life in that district, and believing that it will be of particular interest to readers at this time, it is quoted below:

"Lead and zinc had been mined in the Joplin District up to about 1890 in a crude way by many small proprietors, and concentration was accomplished

William H. Coolidge, Chairman, Executive Committee

* President, American Zinc, Lead & Smelting Co.

largely with hand-jig equipment. When a new prospect was discovered, usually on some farm land, it was under a mining lease requiring payment of 10 percent royalty to the land owner. The discovery was usually made by some small co-partnership, four to six interested parties, rarely by an individual prospector. The discoverers would sink a shaft, usually 5 by 5 ft., inside measurement, and place their equipment of hand-jigs. Sometimes there would be added a rock crusher operated by a small engine. Usually, however, the "free dirt" was all that was handled or recovered, and this was true where the deposit or pocket was very rich "stuff"—"big stuff" it was called.

"The discoverers would build a pole shed or frame over their equipment, cover the frame with tree branches for shade, and proceed to operate their "mine."

"They would reserve four lots surrounding their shaft, for their own operations and stake off the remainder into lots of 200 ft. square. That was the standard size mining lot. These lots would be subleased to other miners. It was the practice to prepare a book, setting forth the name of the discovery lease, and the terms upon which lots would be let to miners. Each mining lot would have one page in this register, and signing the register constituted the contract between the first and second leaseholder. And it was important not to allow anybody to do any work on the ground before signing the register; if one permitted any work to be done before the register had been signed, then the one entering had a three-year tenure and there was no way of forfeiting the right thus acquired if the miner worked a given amount each month "in good faith." And the miner who didn't know what constituted "good faith" would have been thought stupid indeed. It was called "goofeth" and wasn't taken seriously. Transfers of these mining rights were by assignment on the register.

"This register provided for royalty of 20 percent, 10 of which would of course go to the land owner under the first lease, and 10 percent to the owners of the first lease, the discovery company. This added 10 percent was important to the discoverers, as it constituted that much "velvet" and required no outlay by the discoverers. The laws required the owners of the first lease to drain the ground of water for the benefit of the sub-lessees, where the register so pro-

C. T. Millice
General Purchasing Agent

A. W. Dodd
Manager, Eastern Sales, New York

Alan MacEwan
F. W. Knoke
Assistant Manager of Sales, St. Louis, Mo.

Leroy S. Hight
Supt., Roasting Dept., East St. Louis Plant

Robt. E. Kenner
Supt., Smelting Dept., East St. Louis

A. E. Stanton
Auditor, East St. Louis Plant

William Black
Assistant Mine Supt., Mascot, Tenn.

Geo. L. Spencer
Manager, Hillsboro Operations

I. C. Mitchell
Supt., Electrical and Mechanical Dept., Mascot, Tenn.

vided; and in such cases if the ground was not kept free of water, then the sub-lessees could hold all their rights until such drainage would be done. So, the promise to operate pumps and keep the ground drained was usually made orally and evasively, covering the omission, as far as possible, with loud talk and glittering generalities and predictions, and then the sub-lessees were left to deal with their mine water as best they could.

"These first leases were sometimes valuable; in some cases they were worth as much as the fee to the land, and sometimes the sub-leases would be quite valuable, and the operators holding them would make sizable profit from their ore sales, where the operation was well conducted, or the ground very rich.

"And thus there grew up a system of sales of first leases and sub-leases, and sometimes second sub-leases, all having a marketable value. Traffic in these various mining rights and interests was constant and recognized.

"When a discovery was made, or in the vernacular a "strike" was made, much publicity was given; loud would be the statements and extravagant the claims as to the richness of the ore; it would be mentioned in the Joplin paper, perhaps. All this to attract sub-lessees, to induce others to sink shafts and pay the additional royalty. Sometimes samples of ore, too often of uncertain origin, would be exhibited to particular friends and confidential information as to the "big stuff" found would be imparted; this would, of course, find immediate circulation and attract for the big rush when the tract should be opened for subletting to miners.

"These sub-leasing companies of partnerships were usually made up of one or two miners, men who had worked more or less around the "diggings" together with two or three "paying partners," clerks, small merchants and others. These "paying partners" would contribute each week the necessary cash to meet the pay roll. The "working partners" would usually absorb these funds, doing whatever work was done if any. The records consisted of a more or less legible and greasy pocket memorandum, purporting to show the amount of work done and the expense incurred—a little powder, or tool sharpening. It would sometimes be found that the "working partners" were interested in several different places, with differ-

Mt. Le Conte rises higher above its immediate base than any other mountain in eastern America

Between the clouds and a mile above the East Tennessee valley from Sand Myrtle Top of Mt. Le Conte

ent "paying partners" unknown to each other, and the application of the "company money" a matter of much uncertainty and doubt. The important thing for the "working partners" was to keep up the interest and enthusiasm of the "paying partners," and there were wonderful and ingenious stories of the favorable changes in the appearance of the ground, and great predictions of marvelous wealth just ahead.

"Sometimes the "paying partners" growing weary of these "Saturday night strikes," would rebel and discontinue contributions—make no further "pay-in" and let their shares lapse. And usually, on Saturday afternoons the "working partner" would wander into his favorite barroom, carrying chunks or hand samples of ore, presumably from his shaft, and fill up with enthusiasm and beer preparatory to the weekly meeting of the partners and the assessment of funds. When a shaft was newly started and the dirt easily thrown out, enthusiasm would be strong; but after a few weeks the "paying partners" would show less interest as they could see little change in the conditions at the "mine," and it would seem evident that the "working partners" were not over-exerting themselves, or possibly dividing time at some other place. Then if a "paying partner" showed evidence of losing interest, or if he "laid down" and refused further contribution, it behooved the "working partner" to cast about for some new contributor, "rustle a new partner" it was called, usually some stranger. Samples of ore, frequently unlike any material on the dump, would be shown the stranger, to whom would be imparted the inside information that the "working partner" had discovered a good thing, "big stuff" in fact, that he dared not develop or reveal because of the fact that he disliked one of the partners whom he denounced as "not my kind of a partner" and it would be suggested that the stranger might acquire the interest of the objectionable associate. Sometimes the task of acquiring that share would be entrusted to the informant, and sometimes the funds would be entrusted to him. Then there would be renewed interest for a time, and the shaft given a high sounding name.

"Many and wonderful were the ways of the old prospector; he, usually, was a good judge of men; uncouth, smooth as oil, and he could smell a "tenderfoot" a mile away. The "Easterner" who came here and acquired a corduroy suit, wide hat, high-laced shoes and make-up as he conceived a mining man should look, was easy prey to the wiley, uncultured son of Sucker Flat or the Oronogo Bottoms."

Recognizing the importance of zinc as a metal and realizing the possibilities of this field, Eastern capital became interested in the district toward the close of the nineteenth century, bringing about a gradual improvement in mining and milling methods and from then until the present time the Tri-State district has maintained its position as the leading producer of zinc ore in this country.

The American Zinc, Lead & Smelting Company was organized in 1899 by Mr. W. H. Coolidge, Mr. Edward A. Clark and other Boston interests, and was incorporated in that year under the laws of the state of Maine. Mr. Clark was the first president of the company and remained with the company in an official capacity until his death in 1922. Mr. Coolidge, now chairman of the executive committee; Mr. C. A. Hight, director, and F. W. Batchelder, secretary and treasurer, were original officers of the company who have continued with it until the present time. Confident of the future for zinc, Mr. Coolidge has always taken an active part in furthering the interests of the zinc industry in the United States. He was one of the first to advocate an import duty on zinc ores and was instrumental in having such duty incorporated in the Payne-Aldrich Tariff Bill, and it has remained on the dutiable list since that time.

The first mining activities of the company were conducted on properties located in the Carterville camp of the Joplin district in 1901, purchasing in that year a tract of land consisting of 655 acres, known locally as the Davey Farm. This property was located in a section where mining from shallow shafts had been carried on for a great many years. In developing this property, the first large and deep shaft in the district was put down and the property equipped with one of the first large concentrating plants that was built in that district. The ore, sulphides of zinc and lead, occurred in the flint beds of the Grand Falls chert and on account of the regular confirmation of the ore bodies and extension over a wide territory, this section became known as the "sheet ground" area; subsequently, the property was developed with five additional shafts and two additional mills and was operated almost continuously from 1902 to 1919. Approximately 130 acres of ground were mined out on the Davey properties before the ore bodies were exhausted.

The American Company was a pioneer in the successful operation on the low grade sulphide ores in this camp and their operation was a forerunner of very extensive mining operations in the "sheet ground" territory located in the Webb City-Carterville camp which eventually produced more zinc ore than any other section in the United States with the exception of the Oklahoma field which is a part of the Tri-State district. In addition to the Davey mines, operations were conducted on other properties located in the Webb City-Carterville camp, and in later years the company extended its operations to the Oklahoma-Kansas fields.

Toward the end of the nineteenth century immense developments of natural gas in Kansas and Oklahoma were responsible for a number of zinc smelters being established in the gas fields in order to secure the advantage of a plentiful supply of low priced fuel and comparatively low transportation charges on zinc ore from the Joplin district. In 1903 the American Zinc Company acquired a zinc smelter at LaHarpe, Kans. After operating at this point for a short time the plant was sold and in 1906 the company purchased two smelters located at Caney and Dearing, Kans. Included in this purchase was a substantial interest in the gas fields located near the plants. These two smelters consisted of 12 blocks of furnaces with a capacity of from 60,000 to 75,000 tons of ore annually. Operations were conducted at these two smelters from 1906 until after the close of the World War. On account of the enormous demand for zinc during the period of the war the capacity of both of these smelters was materially increased, and a considerable tonnage of zinc ore from the West and from the Wisconsin field was shipped to these plants for treatment.

A gradual depletion of the supply of natural gas for the western smelters, and a necessity of locating a smelter site where a plentiful and regular supply of coal for fuel was assured caused the company to investigate localities in the coal fields of southern Illinois. In 1911 the construction of a modern zinc smelter and sulphuric acid plant was started near Hillsboro, Ill., and this plant was completed and placed in operation in the early part of 1913. It consisted of five blocks of standard type retort furnace, having a capacity of 4,000 retorts,

American Zinc, Lead and Smelting Company

two Hegeler type roasting kilns, and a sulphuric acid plant of the chamber type with an annual capacity of 30,000 tons of sulphuric acid. Later the smelting capacity was increased and two oxide furnaces were constructed at this plant.

Soon after 1900 the zinc and lead mining district in southwestern Wisconsin became a substantial producer of zinc ore. Prior to that time mining in that field was confined largely to lead ore with a small amount of zinc which was shipped to smelters located at Peru and LaSalle, Ill. This field increased its output very materially up to the time of the World War and was looked upon as an important source for zinc during that period. The company became interested in this district in 1908. In that year the Wisconsin Zinc Company, a subsidiary corporation, was organized and a number of properties acquired in the southern part of the field. In addition to the properties purchased a number of mines, with a very substantial production, were developed by prospect drilling in that field, and mining operations were carried on for a number of years, shipping a large part of the output to the company smelters. Conditions in industry after the war did not permit profitable operations and mining in that district was discontinued in 1920.

The company first became interested in the Tennessee zinc fields in 1910 at which time prospecting was started on properties located at Mascot, Tenn. Historical dates with reference to zinc mining in this state correspond closely to the periods when mining of lead and zinc was being carried on in the southeastern Missouri district. Some carbonate of zinc was mined around Jefferson City, Tenn., about 1860 and later mining in a small way for both carbonate and sulphide ores was carried on in various localities in east Tennessee. The section was recognized as having possibilities as a zinc producing field and considerable outside capital became interested from time to time but the output of zinc ore was of little consequence and this section was not considered a factor in the zinc industry at the end of the nineteenth century. Prospecting operations continued over a period of two years, at the end of which time the Mascot No. 1 ore body had been developed and in 1913 a concentrating plant with a capacity of 1,000 tons per day was completed and placed in operation. Later, adjoining tracts of land were purchased and in 1914 Mine No. 2 was developed by shaft, and placed in operation in 1915. In 1916 the Roseberry property, which adjoins the Mascot No. 1 mine on the west was purchased from the Grasselli Chemical Company and equipped with a 600-ton concentrating plant in that year. The mine was operated until 1918.

The capacity of the No. 1 concentrating mill was later increased to 2,400 tons per day, and installation of the flotation process was made. Some notable results were achieved in the flotation experimental work that was conducted on zinc ores at Mascot. The use of copper sulphate in the concentration of zinc by flotation, which is now the universal practice throughout the world, was first developed at this plant. Mining operations have been confined entirely to zinc sulphide ores which are peculiar in that they contain no lead, and, therefore, produce an ore of excellent purity which is particularly adapted to the manufacture of high grade zinc oxide. It is a noteworthy fact that this field is one of the four localities in the United States, all in the Appalachian Region, which produce zinc ore of this character.

The Jarnagin property located near Jefferson City, Tenn., about 16 miles from Mascot was acquired in 1927, and after extensive prospect drilling it was developed by shaft in 1928, following which considerable amount of underground development was done. This property adjoins the Mossy Creek property which was purchased by the company in 1916.

An important adjunct to the mining operations at Mascot has developed from the sale of by-products in the shape of gravel for railroad ballast and construction purposes, and pulverized limestone as agricultural lime.

Along the highway from Knoxville to Cades Cove, showing the main range of the Great Smokey Mountains in the background

Moss covered rocks on the trail to Mt. Le Conte

The properties of the Granby Mining & Smelting Company were acquired in 1916. These properties consisted of a large acreage of mineral lands located in the Granby and Joplin fields of the Tri-State district, a lead smelter and custom concentrating plant, located at Granby, Mo., and a modern coal fired zinc smelter located at East St. Louis, Ill. These mineral lands, particularly those located in the Granby camp, had produced large quantities of zinc ores mostly in the form of silicates for many years. After they were acquired by the American Company a considerable tonnage of sulphide ores was produced from these properties. The silicate ores in this field were mined from shallow deposits practically all of which was produced by lessees on small tracts and a very substantial tonnage was produced in this district until after the close of the World War.

Some additional capacity was added to the East St. Louis smelter after its purchase in 1916 and the plant has been in continuous operation since that time. Soon after 1920 zinc smelting operations were discontinued at the Hillsboro, Ill., plant and zinc metal production since that time has been confined to the East St. Louis smelter.

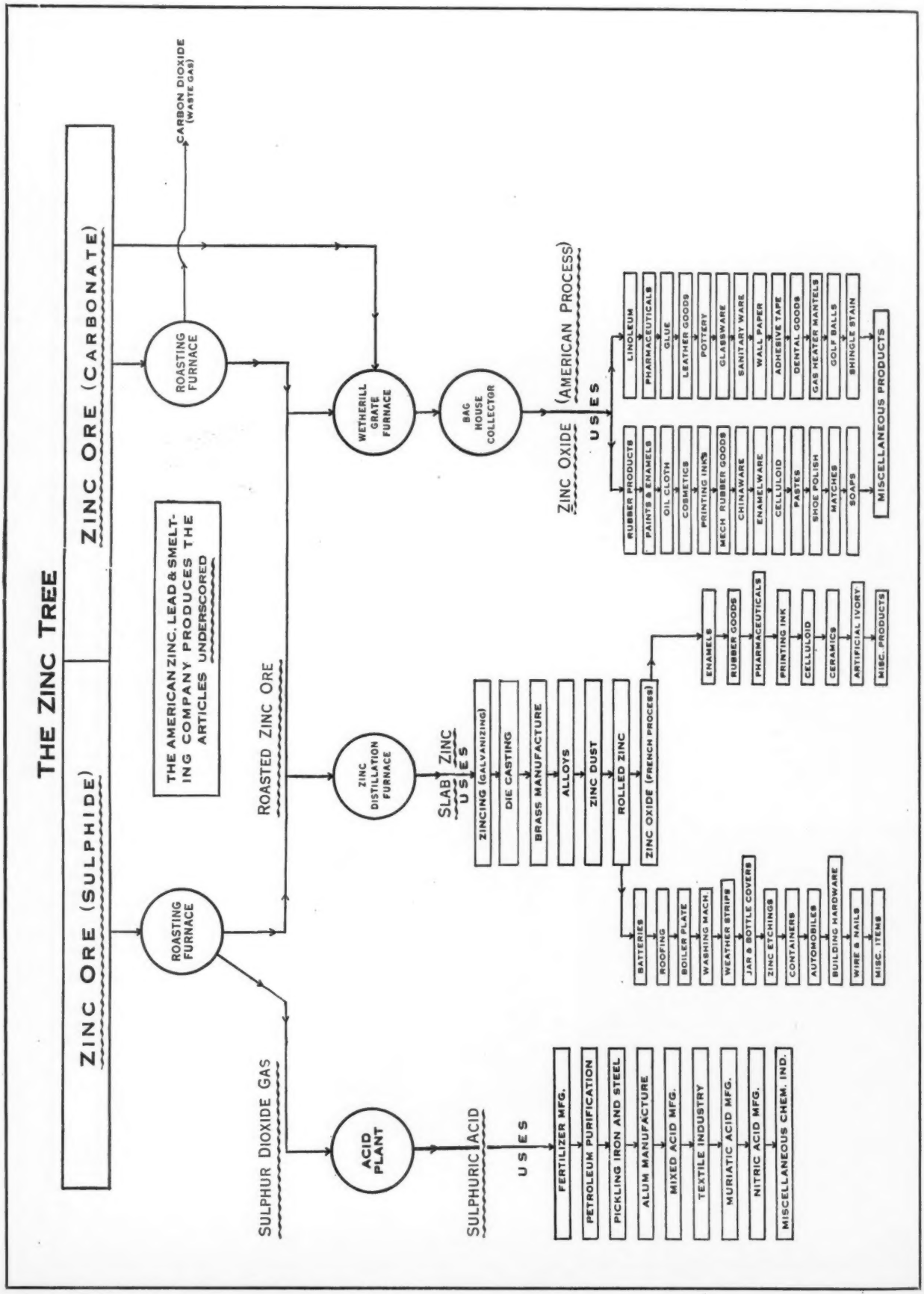
As result of the remarkable growth of the automobile business, which in turn brought about an increased demand for automobile tires, of which zinc oxide is an important constituent, and also as result of the growing use of zinc oxide in the manufacture of paints, a zinc oxide plant was erected by the company at Columbus, Ohio, and placed in operation in 1920. This plant has a capacity of 15,000 tons of zinc oxide annually, derived from ores supplied by the Mascot mines of the company.

The method of manufacture does not differ greatly from standard practice. The ore, after roasting for removal of sulphur, is converted into oxide on Wetherill grate furnaces, collected in baghouse, and after passing through a patented refining process is packed into barrels and bags for shipment. The American process is used exclusively at both the Hillsboro and Columbus plants; the former producing both lead-free and leaded grades, while Columbus is confined to the lead-free product.

Through expansion of the use of by-products produced from Mascot operations the company has acquired substantial interest in two large stone quarries and one sand and gravel plant. With these properties producing coarse crushed-stone, sand and gravel, and the finer crushed-stone from Mascot, the company is in position to supply all of the classifications of crushed-stone products used in highway building, railroad ballast and general construction.

In recent years the public has become more familiar with zinc and its varied uses, but like other basic metals it enters into the manufacture of a very diversified list of articles in which its identity is not disclosed, and therefore it is not generally known that zinc in one form or another is utilized in their manufacture. Due to a wider knowledge of the use of the metal and its alloys there has been a remarkable increase in consumption in the last 20 years, and it seems logical to assume that new uses will be found and additional quantities required in future years.

American Zinc, Lead and Smelting Company



American Zinc, Lead and Smelting Company

ZINC and its Part in the Industries

By A. C. Eide *

ONE may occupy most any station in life but will be dependent on the use of zinc in numerous ways for the satisfactory service derived from a long list of diversified products. Without zinc many articles would lose much of their utility, increase in cost, or be impossible, and many industries would be subjected to a complete readjustment of processes.

Zinc is popularly associated with galvanized iron, the old-fashioned washboard, and zinc ointment without realization of the important functions it plays in several essential industries, notably rubber, paint and ceramic manufacturing. It is impossible to enumerate in detail in these pages all the uses of zinc, but a glance at the American Zinc, Lead and Smelting Company's Zinc Tree on the opposite page showing the partial uses of slab zinc and zinc oxide marketed by them, will give a general idea of the importance of zinc in industry—and many branches could be added to this tree.

Consideration will be given chiefly to the part zinc plays in industries consuming the largest tonnages in the form of metallic zinc and zinc pigments but attention is now called to the fact that zinc is unknowingly encountered daily by many in dozens of ways and rendering a service which contributes much to the necessities and comforts of life. Whether you are using a modern bathroom with its splendid fixtures, enjoying your dinner on friend wife's new set of china, old fashioned enough to light a cigarette with a match, painting or constructing a new building, chasing the elusive golf ball, driving your automobile, or what not one might say, zinc has entered in some form to quietly and effectively play its part.

Metallic Uses

The largest use for metallic zinc is as a protective coating for iron and steel. It is estimated that at least 75 percent † of the prime western zinc used in the United States is consumed in the zinc-coating industries, still popularly referred to as galvanizing, a misnomer conveying the idea of a galvanic action that really does not take place.

Zinc-coating or zincing is accomplished in three different ways: (1) hot process, (2) electro-zincing and (3) sherardizing. The hot process is by far the most important from the standpoint of slab zinc consumed.

When iron or steel has been properly cleaned and pickled in about 7½ percent sulphuric acid to remove scale or iron oxide, then washed, in the hot process it is immersed in molten zinc. An alloy of iron and zinc is formed on the surface and sufficient metallic zinc will adhere to this alloy to cover the entire surface. No other metal permits such ease of application to produce an economic coating on iron and steel that is so highly resistant to corrosion. Electro-zincing requires the casting of zinc in special shapes for use as anodes and through the medium of a suitable electrolyte a zinc coating is deposited on the product to be zinced. In sherardizing iron and steel are coated with zinc by heating with zinc dust in a sealed container. It has considerable value in zincing small articles like nuts, bolts, screws and other small or threaded parts. Zinc coatings are applied to innumerable articles ranging from nails, wire, tubes, pipe to rather large structural material.

The ductility of zinc permits fashioning it into many forms by rolling into strips and sheets, stamping, and drawing through dies. Rolled zinc has been used many years in large quantities for roofing, particularly in Europe. Zinc is so perfectly resistant to corrosion that building materials made from it and properly applied should last far beyond a normal lifetime. An increased consumption of rolled zinc is largely a matter of education and training of craftsmen to apply it properly. The American Zinc Institute through publication and distribution of the Zinc Workers Manual has taken a progressive step to further the use of rolled zinc. Some additional uses for rolled zinc are to be found in the production of electrotypes, dry batteries and boiler plates. Unfortunately for rolled zinc manufacturers, the dry battery business has suffered through the introduction of light-socket power radio sets, but one must yield to progress in this machine age.

Die-casting is becoming increasingly important to the producers of slab zinc, particularly the high grade metal, and is a bright spot in the future of the zinc producers for it presents great possibilities of expansion. The rapid development of die-casting is due in a large measure to the demands of the automobile manufacturers requiring suitable hardware on a mass production basis, and the ability of American zinc producers to promptly furnish in sufficient quantity high quality zinc to serve as the base metal to which generally are added comparatively small quantities of tin, copper and aluminum, or aluminum and copper, and in a more recent type aluminum and copper with a very small amount of magnesium.‡

Brass is familiar to everyone. In its production, zinc becomes a companion of copper which preponderates in quantity in the alloy, but certainly not in importance. The varying proportions of copper and zinc with the smaller quantities of lead permit a wide variety of brass for an endless number of uses essential in our peaceful pursuits or on the battlefields of the world. Other important alloys containing zinc are bronze, german silver, gun metal and many types of solder.

Zinc dust, previously mentioned in connection with sherardizing, is a valuable chemical reagent ranging in use from the dye industry as a reducing agent to a precipitating agent for gold in the cyanide process, also more recently as a paint pigment for special purposes.

Zinc Oxide

Admittedly the discussion of the use of zinc in metallic form is left incomplete to consider its role as a pigment where a field is encountered that perhaps is not so well understood except by those closely associated with it; a field, nevertheless, that is extremely interesting and highly technical in many of its phases.

Zinc oxide is indispensable in the manufacture of the present-day paint and rubber products, not that it is cheaper than some other pigments, but because it imparts properties to finished products that are unobtainable from any other material. It is produced by two methods known as the French and American processes. In the former, also called indirect process, zinc metal is vaporized and oxidized by air to zinc oxide, which is collected in a bag house. In the American process properly selected oxidized zinc ores are mixed with fuel and burned on a grate furnace, and the zinc vapors produced are burned directly to zinc oxide and collected. French process zinc oxide generally is substantially lead free or carries a very low lead content. American process zinc oxide is made in lead free grades and leaded grades ranging from 5 to 35 percent lead sulphate content, though by far the greatest tonnage produced is the lead free type. In

* Sales Engineer, American Zinc Sales Co., Columbus, Ohio.

† U. S. Department of Commerce "Zinc in 1928" (General Report).

‡ U. S. Patent 1,596,761.

Limestone Plant, American Zinc Company, of Tennessee, Mascot, Tenn.

1929 the production of lead free zinc oxide, French and American process, amounted to 160,611 tons and the leaded grades 27,149 tons.* American process zinc oxide has the greatest usage, since it serves the purpose equally as well or better in most cases than French process and is less expensive.

Zinc oxide is a fine, brilliantly white, opaque pigment, readily miscible with linseed oil and other paint vehicles, consequently, the paint industry is one of the two largest consumers.

For nearly 2,000 years white lead was the only white pigment available, and it was in 1847 that the famous French contractor, Le Claire, introduced zinc oxide into commercial use as a paint pigment. It has since reigned supreme in France, due to its durability and non-poisonous character. What purpose does zinc oxide serve in a paint? Pure white lead in oil paint dries to a soft film which results in chalking, one of the first signs of paint failure. Zinc oxide in a paint dries to a hard film, therefore, when used in conjunction with white lead, overcomes its softness to produce a harder and more durable film. Zinc oxide is whiter than white lead, and has a greater hiding power or opacity. Less zinc oxide can be incorporated in a gallon of linseed oil than white lead, because of its greater oil taking capacity, but this property adds greatly to the spreading properties of a zinc oxide paint. Newer pigments like Titanox and Lithopone also fail by chalking in outside paints, and zinc oxide is necessary for their success in exterior paints. Zinc oxide does not darken when exposed to the action of sulphur gases common to many industrial centers.

While sunlight is essential to our bodily welfare, it is extremely destructive to paint films on account of the penetration of the ultra-violet rays. Zinc oxide has the unique distinction of being the only white pigment that stops ultra-violet rays at the surface, thereby giving lasting properties to paints exposed to sunlight.

For the highest grade enamels, which are pigments ground in a varnish liquid, zinc oxide is extensively used, though for many types of enamels, French process zinc oxide is required on account of its more brilliant color and fineness of texture. In lacquers zinc oxide is a stabilizer for the nitro-cellulose.

Zinc oxide plays its part in the floor-covering industry in a manner closely akin to paints and enamels. Floor cloth is largely the coating of a fabric with successive layers of an oil paint on which a design is printed by specially designed machinery. As a result, the properties of zinc oxide are taken advantage of as in paints to produce firmness, gloss, whiteness, opacity and clean tints in floor-covering products.

Rubber Products and Zinc Oxide

More zinc oxide is used in rubber manufacturing than any other single industry, and it is one of the most important ingredients in rubber compounding. Specifications for a suitable zinc oxide in this industry are most exacting, both as to chemical and physical make-up. For most purposes it must be substantially lead free, a faint trace of copper can be extremely detrimental to the compound, and even slight amounts of coarse zinc oxide, foreign or tramp material can not be tolerated. Satisfactory chemical requirements may be met, but it gives no assurance of satisfactory working properties, for this can not be predicted chemically. The physical properties, particularly particle size, are all-important. Fineness of subdivision and uniformity of particle shape have a vast bearing in the properties of a rubber compound in process and after curing has been completed. Different grades of zinc oxide for special purposes are graded in accordance with the particle size and shape. The rubber technologists are ever on the alert to improve rubber products or processes, and their demands are reflected in the zinc industry by development of zinc oxides specially suited to their needs.

Many may think a material like zinc oxide in rubber could only be a filler or adulterant to cheapen the compound, but this notion is far from the facts, for the reason that zinc oxide in reality is much more expensive than rubber at market prices which have existed in recent years. True, zinc oxide costs less per pound, but the rubber manufacturer must figure on unit volume costs. Considering the specific gravity of 5.6, a cost of 6½ cents per pound of zinc oxide is equivalent to rubber at approximately 40 cents on a volume basis.

Zinc oxide has two distinct duties to perform in a rubber compound; first, an activator for the organic accelerators needed to speed up the curing or vulcanization process; and, second, a reinforcing agent to toughen the rubber. For purposes of activation 5 to 6 percent of zinc oxide on the rubber depending on the type of compound will suffice, while to take advantage of other properties imparted to rubber up to 60 percent by weight is not uncommon in solid and pneumatic tire stocks which are subjected to heavy loads and high speeds on our modern highways.

There is some analogy between a paint and a rubber compound, even though they appear widely different. In the former the zinc oxide and other pigments are dispersed in a liquid medium by grinding on burr-stone mills, roller mills or pebble mills. The dispersion of pigments in a plastic material such as rubber is accomplished by mixing on two large steel rolls operating at unequal speeds, or Banbury internal mixers. In either case the success of the finished product is largely dependent on completely surrounding each individual pigment particle with the medium used. Zinc oxide meets the requirement of rapid and good dispersion in both paint vehicles and rubber.

Mention has been made of the reinforcing properties of zinc oxide in rubber, which means increased tensile strength, resistance to abrasion, cutting, and tear, necessary properties in rubber tires for example, but the value of zinc oxide does not end here. Two of the most destructive agencies rubber must withstand are age and heat. No pigment is comparable with zinc oxide to overcome the heat factor in rubber stocks.

When a solid tire or large pneumatic bus tire is pounding over the road, internal stresses and friction generate enormous quantities of heat. This energy must be dissipated to avoid deleterious effects to the rubber. Zinc oxide, by reason of its low heat generation, high heat conductivity, and capacity, add long life by maintaining a lower temperature in the tire under service conditions than would otherwise exist.

It is not the intent to convey the impression that zinc oxide should be used as a reinforcing pigment in rubber to the exclusion of others. Carbon black is equally important, and we find both of them extensively used together to bring out desirable properties that add value to rubber products. However, zinc oxide is the only white reinforcing pigment available for use in white sidewalls. Other pigments, lithopone for example, may be used for the color effect, but it does not appreciably enhance the wearing properties of the rubber stock.

There are few important rubber products made without zinc oxide, and we find it playing a splendid role in tires and tubes, insulated wire, rubber footwear, druggists' sundries, mechanical rubber, rubber clothing, molded goods, etc.

Miscellaneous Use of Zinc Oxide

Turning now to industries consuming smaller quantities of zinc oxide, ceramic manufacturing heads the list. In vitreous enamels it acts as a flux and gives the product a (*Continued on page* 832)

* U. S. Department of Commerce of figures.

General view of concentrating plant, American Zinc Company of Tennessee, Mascot, Tenn.

History of Zinc in Tennessee

By **Charles M. Seymour** *

ALTHOUGH zinc was discovered and its exploitation began about the middle of the nineteenth century, it was not until the American Zinc Company of Tennessee began its large-scale mining and concentrating operations at Mascot, in Knox County, that the zinc deposits of Tennessee were looked upon as being of much commercial importance.

John C. Branner, late president of Leland Stanford, Jr., University, and one of the noted geologists of the country, was born at Newmarket, Tenn., in 1850, and it is an interesting fact that in 1854 the exploitation of zinc began in Tennessee by Dr. Branner's relative, Benjamin M. Branner, granting a 99-year lease to A. W. Daby on 400 acres of Branner's farm near the town of Mossy Creek, Jefferson County, about 4 miles from Newmarket.

Mossy Creek Mine

The lessee, Daby, with New York connections, undertook to operate the property, but by June, 1858, operations ceased. Then came the Civil War, and as the royalty features of the lease had not been lived up to, Branner brought suit in the Chancery Court of Jefferson County to have the lease declared forfeited, which was done by decree entered June 13, 1866.

On September 7, 1867, John R. and B. M. Branner deeded to East Tennessee Zinc Company (of New York) all the zinc ores and other minerals in the same 400-acre farm leased to Daby in 1854.

This company erected a plant to work the zinc ores for the manufacture of white oxide, but in a few months the company was in financial troubles, and a number of suits were instituted against it, all of which were removed to the United States Court at Knoxville and consolidated under the title, M. C. Wilcox et al. vs. East Tennessee Zinc Company. This litigation continued for 13 years, when the property was sold in 1882 by the clerk of the court to Thomas H. Heald, who organized the Edes, Mixter and Heald Zinc Company, which operated the mine at Mossy Creek intermittently until 1894.

The property was mined for the zinc sulphide which was concentrated at the mine, and the concentrates shipped to a smelter at Clinton, in Anderson County. Several thousand tons of ore were mined by the Edes, Mixter and Heald Zinc Company, but no records are available to determine the exact amount. The operation was not a financial success.

In 1894 the Edes, Mixter and Heald Zinc Company permanently ceased operations in Tennessee. In 1901 the American Metal Company did some small-scale mining at Mossy Creek. The property then became inactive until 1911, when the Osgood Exploration Company did some prospecting.

On May 29, 1916, the American Zinc Company of Tennessee purchased the property from the trustees in liquidation of the Edes, Mixter and Heald Zinc Company, and operated the property from 1916 until 1919, extracting sulphide ores which were shipped to the American Zinc Company's concentrating mill at Mascot. Operations have been suspended since 1919.

Lead Mine Bend

The second point in Tennessee where zinc mining was conducted on a commercial scale was in the northeast corner of Union County, in a district long known as the "Lead Mine Bend" of the Powell River.

In this district zinc is associated with lead, and the presence of lead was noted by the early settlers, so that deeds reserving the mineral interests are found of record dated about the beginning of the nineteenth century. It was not, however, until 1883 that the property was mined on a commercial scale, and then only for lead, the ore being hand picked and hauled by wagon to the Powell River, and then floated down the Powell and Clinch Rivers to Clinton,

* Director and Member of Executive Committee.

Tenn., and shipped to New York from that point by rail.

The mines were operated intermittently until 1888.

In 1889 the property was acquired by the Edes, Mixter and Heald Zinc Company, which built the first mill in 1890, consisting of a crusher and hand jigs. The present mill, with a capacity of 100 tons, was built in 1891. The company produced both lead and zinc.

The lead ore was hand picked and shipped in bags to New Jersey. The zinc ore was concentrated, and the concentrates were floated down the Powell and Clinch Rivers to the zinc smelter at Clinton.

The operations continued intermittently until 1894. During the period of operations about 50 tons of zinc concentrates a week were shipped to Clinton.

In 1899 the property was leased to the American Metal Company, which conducted small-scale operations until 1901, the concentrates being shipped to Marion, Ind. No commercial operations have occurred since that time.

In 1914 the property was acquired by the Union Zinc Company, organized by A. A. Blow, deceased. The stock of this corporation is controlled at the present time by his son, George Blow, mining engineer, of Knoxville and New York. The Union Zinc Company conducted some exploration operations for three or four years, but the property has been entirely inactive since 1918.

Straight Creek Mine

This mine is located in Claiborne County, 4 miles west of Lone Mountain station on the Cumberland Gap branch of the Southern Railway. It was first opened about 1880, and since then has been worked intermittently by several companies. The earliest operations consisted of mining carbonate ores in open pits, the concentrate being hauled by wagon to the Clinch River and thence by water to Clinton, where it was smelted.

About 1890 the Edes, Mixter and Heald Zinc Company bought the property and erected a mill equipped with a crusher, hand jigs, and rolls. Both carbonate and sulphide ores were mined and concentrated. The concentrates were hauled to the railroad at Lone Mountain and shipped to Clinton for smelting. These operations ceased about 1894.

About 1906 the Tennessee Zinc Company, of Cincinnati, Ohio, acquired the property, built the present mill, and engaged in mining and prospecting for a period of two years, since which time all operations have been suspended.

Zinc Smelter at Clinton

About 1880 a Mr. Richburg acquired the Straight Creek mine in Claiborne County, which at that time appeared to be the most promising zinc deposit in Tennessee. He built the first zinc smelter at Clinton, primarily to smelt the carbonate ores from the Straight Creek property. The smelter consisted of one block of 76 retorts. He imported a contingent of Belgians to operate the smelter. In 1883 the smelter was purchased by the Edes, Mixter and Heald Zinc Company and placed in charge of Mr. DeBonie, a Belgian.

In 1888 Mr. Peter E. Blow, of Knoxville, came from the Joplin district and took charge of the smelting operations of the Edes, Mixter and Heald Zinc Company. In a few months he rebuilt the furnace, making two blocks of 127 retorts each, with a capacity of 3,220 pounds of spelter per day.

After enlarging the capacity of the smelter at Clinton, it was discovered that it was difficult to procure ore enough to operate on a capacity basis. The ore that was being shipped down the Clinch River from Lead Mine Bend was dependent on tides in the river, as frequently the river was unnavigable even for flatboats. The smelter also received ores from the Straight Creek and Mossy Creek mines.

The smelting operations at Clinton permanently ceased about 1894, when the Edes, Mixter and Heald Zinc Company suspended operations in Tennessee.

Newmarket Mines

One of the largest successfully operated districts in Tennessee for the production of oxidized zinc ores is in the vicinity of Newmarket, in Jefferson County, where operations were conducted from about 1892 until 1913. During the early years of operations the concentrates were shipped to the Bertha Smelter at Pulaski, Va. After the Grasselli Chemical Company acquired its Grasselli mine, at Newmarket, it shipped the concentrates north.

It was known to the officials of the Grasselli Chemical Company that its carbonate ores were underlain with sulphide deposits, and for a number of years the company prospected for the sulphides by drilling. After blocking out a large tonnage of these ores the company sank a shaft and drove drifts into the ore body. The company, however, has not undertaken to produce ore, and at the present time the mine is idle.

East Tennessee Zinc Mine

This mine, consisting of two open cuts and a mill, is on the north side of Lost Creek, about 2 miles southeast of Newmarket. Zinc was discovered here in 1894, and Mr. John G. Long mined and shipped several carloads of carbonates. In 1898 the Ingalls Zinc Company purchased the property and erected a mill for the concentration of sulphide ores, and conducted open-pit operations for about three years, when the property was purchased by Mr. George Currens, who operated it for about a year. He then leased the property to the Newmarket Zinc Works. The latter operated the property for about six months.

In 1907 M. Casewell Heine, Esq., an attorney of Newark, N. J., leased the property and prospected for about one year; then organized the Tennessee Mineral Company, which purchased the property. The Tennessee Mineral Company operated until January, 1911, when it leased the property to the American Zinc Company of Tennessee, which company operated for a period of six months and then suspended.

During the World War Mr. Heine organized the East Tennessee Zinc Company and operated the property until 1918, since which time it has been idle. In 1922 the Mechanics' Bank & Trust Company foreclosed a mortgage on the property, but it was again acquired and is controlled by Mr. Heine.

Embreeville Mines

Embreeville is situated on the Nolichucky River, in the southeastern part of Washington County, about 14 miles from Johnson City, and was from the earliest settlement of Tennessee noted for its iron deposits. It was also known for a long time that zinc was associated with the iron, but no effort was made to develop the property for zinc until 1913, at which time the company was in the hands of a receiver, having become financially involved in its efforts to operate the company for iron. In 1913 the Embree Iron Company started producing zinc ores for shipment, and continued on a large scale, especially during the years of the World War and up to and including 1923, since which time the company has operated continuously, but the production of ore has fluctuated and as a whole has not been of particular importance.

Mascot Mines

The zinc mines at Mascot are located in Knox County, on the Southern Railway, about 13 miles northeast of Knoxville.

The presence of zinc ores in this vicinity was discovered and an attempt to exploit the same was made a short time after the discovery of zinc at Mossy Creek, in Jefferson County.

The first ore leases were taken from John M. Carter in 1858. This was on property subsequently mined through Mascot mine No. 3. Prior to 1900, however, the properties in the Mascot district were worked only by open pits for oxidized ores, and the production was very small. In 1902 the Roseberry Zinc Company was organized. That company sank a shaft to a depth of 187 ft. This shaft is now known as Mine No. 3 of the American Zinc Company of Tennessee. The Roseberry Zinc Company produced both carbonates and sulphides, but the bulk of the production were carbonates from the large, open cut located on the west bank of Roseberry Creek.

In 1911 the property was sold to the Grasselli Chemical Company of Tennessee, which continued the development of the underground mines until 1916, when the property was sold to the American Zinc Company of Tennessee. This company erected a concentrating mill at the shaft and operated the property until 1918, when mining operations were suspended and the mill was dismantled.

In 1903 the Holston Zinc Company, a Tennessee corporation, was organized and began operations in both carbonate and sulphide ores, just west of Flat Creek, in Knox County, on property now known as the American Zinc Company Mine No. 1. That company sank a shaft to a depth of 170 ft. at a point 670 ft. north of the present shaft of the American Zinc Company's No. 1 mine. This shaft has now been abandoned.

The Holston Zinc Company built and operated a concentrating mill on Flat Creek, a few hundred feet southeast of its shaft.

In 1908 the property was taken over by the Kewanee Zinc Company, of Illinois, and its operations were in charge of Mr. J. M. C. Howell, of Mascot. In 1909 Mr. Howell brought suit in the Chancery Court of Knox County to wind up the company upon the grounds of insolvency.

In 1910 the American Zinc, Lead and Smelting Company, at that time the largest producer of zinc in the Joplin, Mo., district, employed Samuel W. Osgood, a mining engineer, to go to Tennessee to conduct extensive exploration operations in the Mascot district. Mr. Osgood took options and conducted these operations (*Continued on page* 833)

American Zinc, Lead and Smelting Company

Quarry and crushing and screening plant, American Zinc Co. of Tennessee, Mascot, Tenn.

GEOLOGY at MASCOT

By **Mark H. Newman** *

FOLIO No. 75 of the United States Geological Survey gives the general topographical and geological features of the quadrangle in which the Mascot mines are situated.

Topographically it is a region of parallel and broad rolling valleys with sharp intervening ridges. Topographical features fundamentally are structural. Limestones and shales occupy the valleys—sandstones and quartzites form the ridges. Overthrust faulting has resulted in duplications. Each valley is much like its neighbor in respect to succession and structure, which commonly is monoclinal.

The structure at Mascot follows the regional habit, being monoclinal. The strike of the formation bears somewhat north of east and the dips, where mining is active, vary from 15 to 25 degrees to the south. The formation of interest, zinc-wise, is the Knox dolomite. Strictly speaking, the Knox is a highly magnesian limestone, carrying horizons of limestones and cherty dolomites. It has been given a thickness of upwards of 3,000 ft. and is referred to Cambro-Silurian age by the United States Geological Survey.

The ore bodies at Mascot fall structurally at about the bottom of the upper third of the Knox. The ores are associated with shattered or brecciated dolomites. The position of shattering is more or less coincident structurally with a zone of interbedded dolomites and brown limestones. The shattering, therefore, may be said to occupy a structural position in the formation. The brown limestone beds, whose number varies as to locality up to possibly six, have maximum individual thicknesses of possibly 10 ft.—they are lensy, with a tendency toward overlapping, and occupy a zone of 100 to 150 ft. in thickness. Considerably more than half of the brown limestone zone is made up of dolomitic beds typical to the Knox. The dolomites in this relation appear to shatter readily—the limestones do not shatter. Usually when in association with shattered dolomites, but frequently when not, individual brown beds are found to have been metamorphosed into coarse grained dolomitic marbles. Almost invariably a Mascot ore body will be found to have its bottom on, or in, some one such marbleized bed. The relation of ore to this alteration is recognized universally. It is a help to prospecting. Shattering usually involves at least the upper part of the brown limestone zone—frequently the entire thickness is involved—but mineralization by zinc usually stops at some upper or intermediate marbleized bed. Laterally, both the extent and degree of shattering is irregular and unmeasured, but considerable part of the brown limestone and associated horizons, considered areally, being unshattered. Both laterally and vertically, brecciation and shattering disappear through cracked phases into undisturbed ground.

The ore bodies, while large, follow irregular and sometimes quite tortuous courses within the brecciated and cracked formation. This wandering habit is apparent on *Figure* 2 of the accompanying article by Mr. Coy. It is believed that in most (*Continued on page* 833)

* Chief Geologist, American Zinc, Lead & Smelting Company, Mascot, Tenn.

Large Pillars in Mined Stope

6 in. Shaft timbers are of 8 by 10-in. white oak. The rock requires no timbering for support.

The shaft is in the hanging wall and south of the main No. 2 ore body. When the shaft site was chosen, prospect drilling had determined the outlines of this particular ore body, as it appears in *Figures 1* and *2*. Other nearby ore bodies were developed later.

A short cross-cut connects the shaft station with the ore body. From the end of this cross-cut, drifts were driven east and west in ore near and parallel to the hanging-wall side of the ore body. From the ends of each of these drifts inclines were driven. The west incline is 600 ft. long and rises from the end of the west drift on a slope of 24°, and the east incline starts at the east end of the east drift and follows a slope of 22° downward. Each incline followed closely the upper and south edge of the ore body. From these inclines drifts were turned off in ore at vertical intervals of 50 to 75 ft. Open stopes were developed from these various drifts and were mined by heading and bench methods. The ore was hand-loaded.

In the earlier development all of the haulageways were established on the hang-wall side of the ore horizon. The general haulage scheme now in use includes these hanging-wall drifts and the two inclines. As new ore bodies were developed, it was found that mining practice could be improved by using underground glory holes or mill holes, as they are termed locally. Mill-hole development involves driving a raise from a point below the ore, and for this reason later haulageways have been established in the footwall.

In the early operation of the mine open-stope mining was supplemented by sub-leveling, all of the ore being hand-loaded. More recently mill-holing and slushing have in large part replaced

Development

NUMBER 2 Mine was developed from a single vertical shaft 612 ft. in depth. The main haulage level was broken off at 520 ft.; the loading station for skips is at 582 ft. A vertical 6 by 6-ft. raise connects the bottom of the shaft with the No. 5 level and provides a draw-off for the spill incident to skip-loading.

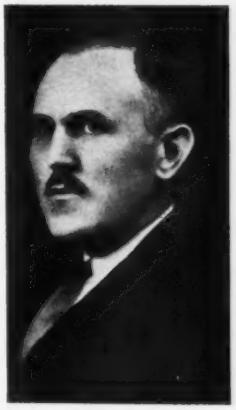
No. 2 shaft is a square set shaft and has four compartments. The top 48 ft.—from surface to rock—is concreted. Three of the compartments, one cageway and two skipways, are 5 ft. by 5 ft. 6 in. The fourth compartment, which carries the discharge columns, power lines, signal lines and ladderway, is 3 ft. by 5 ft.

† Mine superintendent, American Zinc Company of Tennessee, Mascot, Tenn.

METHODS at Mascot Mine No. 2

of American Zinc Company of Tennessee

By **Harley A. Coy†**



these earlier methods. A comparatively small percentage of the output is hand-loaded. *Figure 3* illustrates the various steps in the development of these processes. Reading from right to left on this illustration, the various stages are: *A*, Prospecting at low elevations is by cross-cut and diamond drill. *B*, In early mining days, after the toe of an open stope reached the footwall, sublevel mining cleaned up such ore as remained between main haulways. *C*, Shovel stopes are opened up from cross-cuts passing through the ore body. *D*, After the mill-hole reaches the angle of repose for broken rock, such ore as remains is slushed to the mill-hole raise. *E*, Typical example of mill-hole before slushing equipment is installed. *F*, In thin ores at considerable distances above the haulageway mill-holing is supplemented by slushing. *G*, Mill-holing a thick ore body a considerable distance above the haulageway.

A mill-hole is developed by driving a raise either from a haulageway or from a cross-cut in the footwall. It is driven through the footwall and ore to such a height as to intersect the horizon that has been predetermined as the roof of the individual working place. A chute is installed at the draw point, and the raise is reamed from 5 by 5 ft. to 10 by 10 ft. A drift or incline, as the case may be, is driven from some nearby working place to intersect the top of the raise, its purpose being to provide access for men and pipe lines to the top of the raise.

After mining of the mill hole has advanced its heading to a point so far from the raise that the ore will no longer deliver to the raise by gravity, either a second raise is driven to intersect a side of the mill-hole or a drag is installed to slush the ore to the original raise. The choice of method depends upon the height of the bottom of the ore above the haulageway and upon the thickness of the ore. Where it becomes necessary to mine from open stopes with hand-shoveling it is customary to attack the ore from the hanging-wall side and to mine the ore by the heading and bench system. *Figure 4* shows the location of holes, number of cartridges used, and the order of firing. Heading holes vary from 6 to 10 ft., and bench holes are seldom drilled over 10 ft. Thirty percent low-freezing gelatin dynamite is used in shooting all holes.

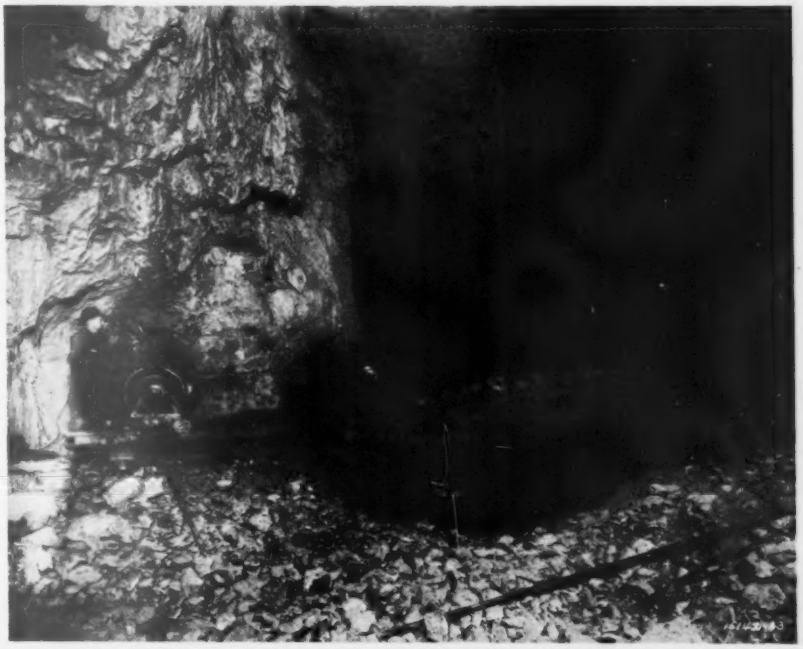
All main haulageway drifts are driven to 8 by 8-ft. cross-section. All cross-cuts are driven to 7 by 7-ft. cross-section. (See *Figure 5*, which shows the depth of holes, number of cartridges used, and order of firing.)

In so far as possible, track grades in all drifts and cross-cuts are held to 0.50 percent, the grade being in favor of the loads. On main haulageways the minimum curve has a 75-ft. radius. Few curves with less than a 50-ft. radius are used in stopes. In some few hand-loading stopes curves with a radius of 25 ft. are used. Standard trackage is of 40-lb. rails and 24-in. gauge.

Stoping

The total production is mined by the heading and bench system. Eight-foot headings are cut immediately under the bed that has been chosen for the roof. In mill-holing and in open-stoping the system used is the same, except that in developing a mill hole the mining spreads out in all directions from the top of the raise, while in open stoping the attack is entirely from one side. In both methods care is taken in spotting pillars so that such a maximum spread between pillars may be taken as is consistent with maintenance of good roof conditions.

The ore bodies vary in thickness. They occupy a low dipping position, with the result that the bottom of the ore stands at varying heights above haulageways. These two factors determine whether the ore shall be developed for mining by mill-holing or by slushing. Where the thickness of ore is sufficient and the developments required are not excessive



An 1,800-lb. manganese steel scraper, capable of pulling about 2 tons per load, is used with this 25-hp. hoist. Distance hauled is about 250 ft. An average week's work of five days, four hours each, is approximately 800 tons.

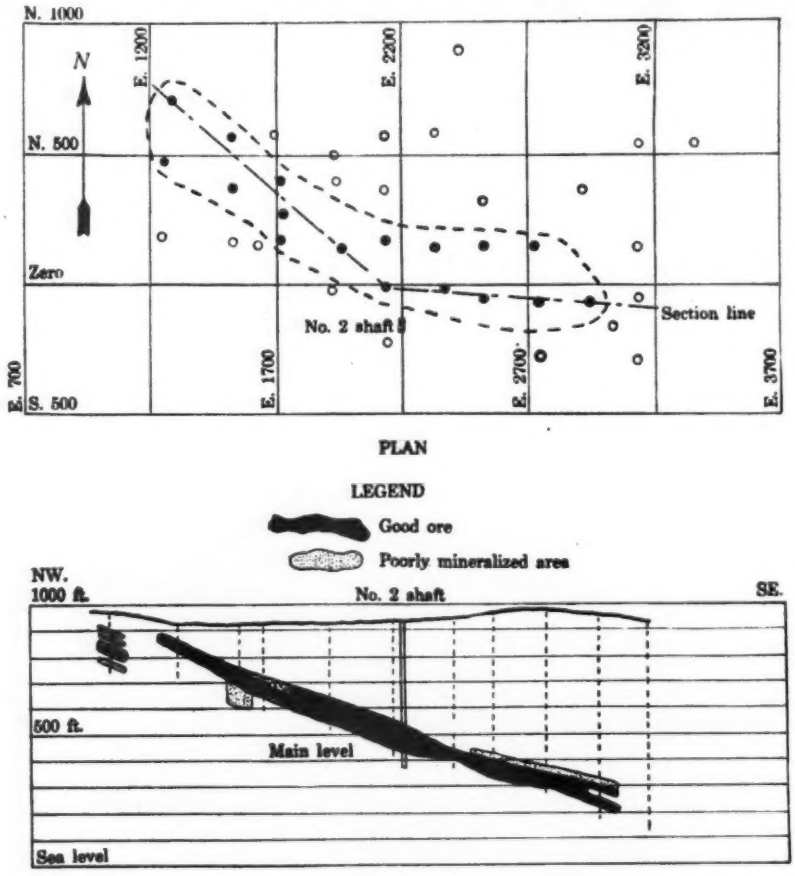


Figure 1. No. 2 ore body as outlined by surface drilling at time of sinking No. 2 shaft

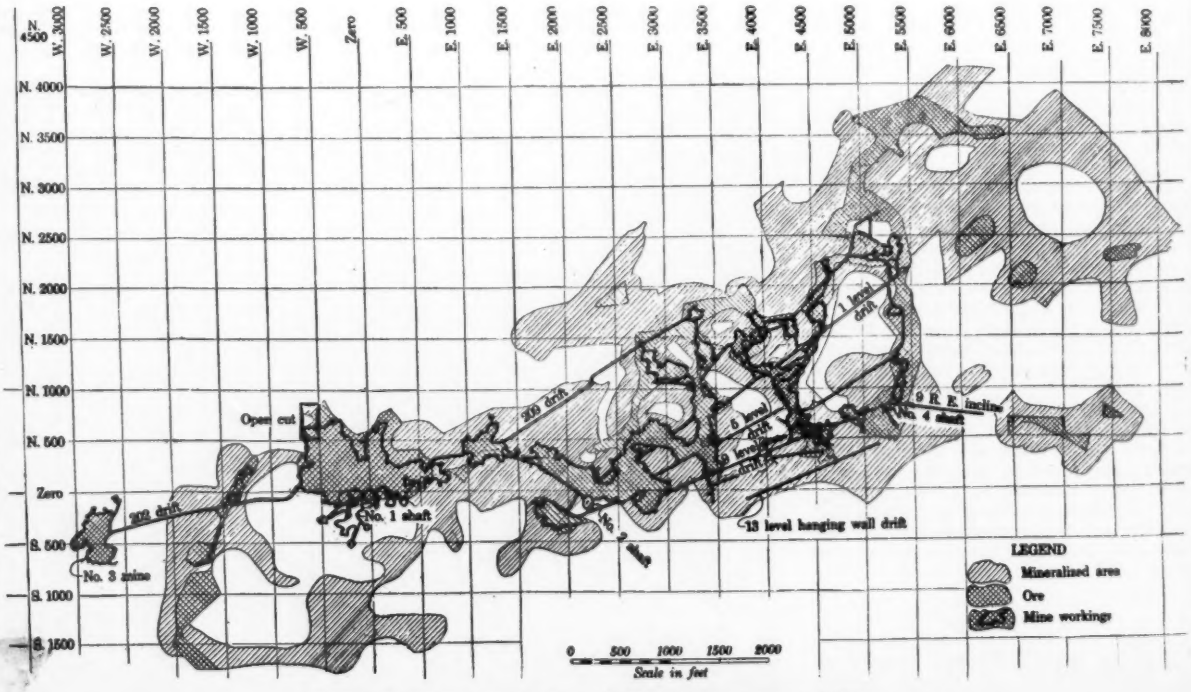


Figure 2. Mascot ore body, as indicated by prospect drilling

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Plan of a portion of No. 2 Mine

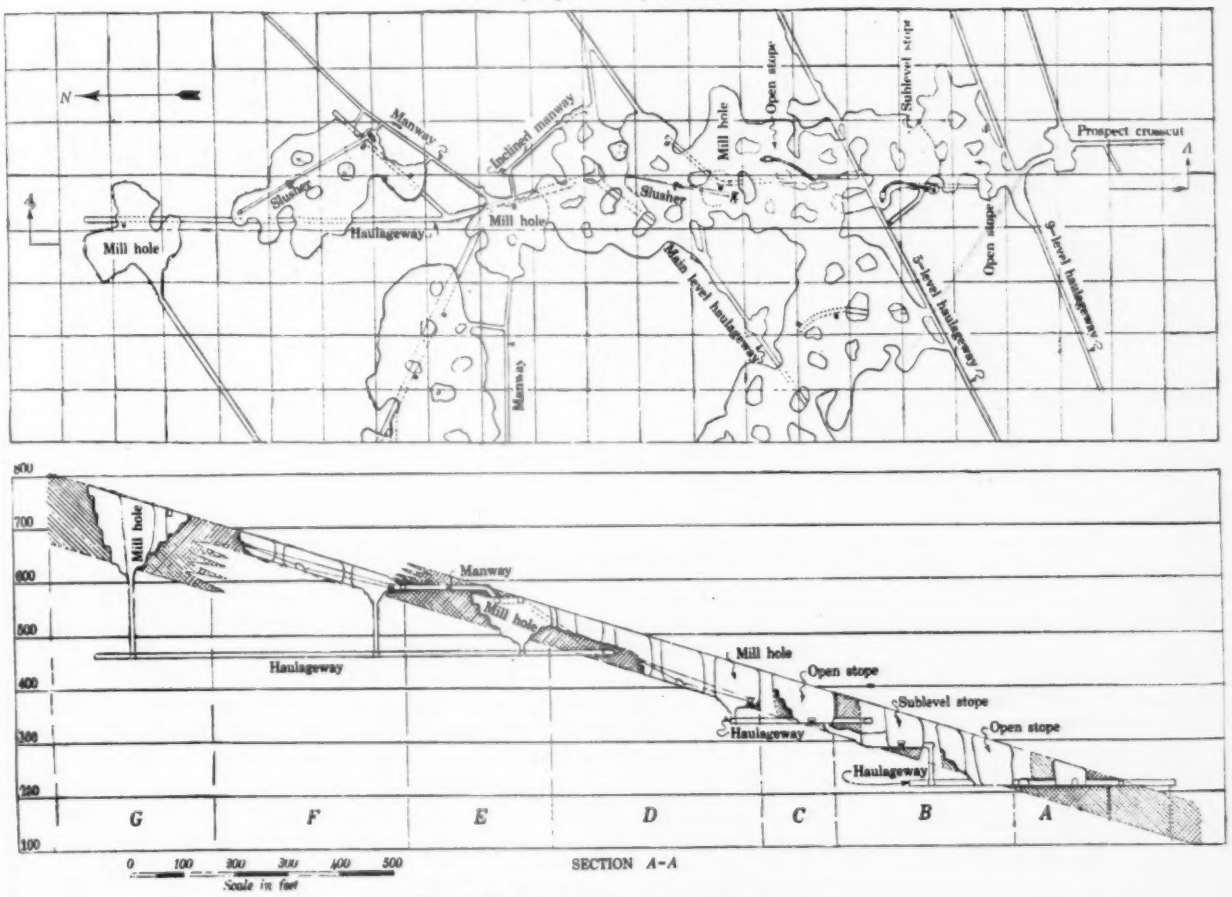

Figure 3. Development of mining processes

mill-holing is preferred, but where long drifts and high raises are required, and where the thickness of the ore does not justify so much development, slushing is being used. The first developments looking toward slushing are identical to those of mill-holing, in that a raise is driven as in mill-hole development. Regardless of the height of ore, the first mining is by mill-holing; slushing follows. In the old mill holes, where height above haulage is unfavorable to the driving of secondary raises for further mill-holing, the outlines of the original mill hole are extended by slushing.

No reserve of broken ore is stored in stopes or in mill holes. Any ore that may be left in mill holes at the end of the day shift is drawn off on the following night shift. It is important for the maintenance of grade that the working faces be uncovered each day, in order that foremen may judge it before ore for the current shift is broken.

Drilling and Blasting

All drilling and blasting (except development) is on day shift. The drilling and blasting of all development work, which includes drifting, raising, reaming, slabbing, etc., are done on night shift. All development rock is shoveled on the day shift. The night shift crew, except men working on development, consists of chute pullers and shovelers. Approximately one-third of the mine's production is moved on this shift and the remainder on the day shift. All rock from development work is moved with the ore on the day shift and goes to the mill with the ore, no sorting of waste being attempted.

A day's work underground consists of two 9-hour shifts. The night shift relieves the day shift at 4 o'clock in the afternoon. During the period between 1:45 and 6:00 a. m. no work, except development drilling and shooting, is being done. About 12 hours is required for the drilling out and shooting of a standard development heading. This cycle of operations allows members of the night shift to get their rest during the early part of the morning, a desirable arrangement during the summer months.

Denver dreadnought hammer drills, model 60, mounted and unmounted, are standard equipment in stope and mill-hole work. Ingersoll model 248 and Denver model 7 drifters are used in development drifting. Ingersoll B. C. R. 430 jackhammers are used in blocking in stopes, and in mill holes and at chutes. Ingersoll model B. C. 21 stoping machines are used in raise work.

One and one-quarter inch hollow round drill steel with Carr bits is used entirely in drifting and stoping. Seven-eighths-inch solid hexagon steel with cross-bit is standard equipment in raising. All blocking machines use ⅞-in. hollow hexagon steel with Carr bit.

The placing of holes for drilling drift, shaft, and raise rounds appears in *Figures 5, 6* and *7*. *Figure 5* has already been discussed. *Figure 6* shows a standard shaft round, with the depth of holes, number of cartridges used, and order of firing. *Figure 7* pictures a standard raise round, showing the depth of holes, number of cartridges used, and order of firing. Mill-hole raises are driven 5 by 5 ft. and reamed to 10 by 10 ft. Thirty percent low-freezing gelatin dynamite in 1⅛ by 8-in. sticks (extra plastic) is standard explosive for all work. Forty percent dynamite of the same grade is issued to development contractors for use in shooting drift cuts in unusually hard-breaking ground.

Loading

All shoveled ore from stopes is loaded on a ton-contract basis. Loading in development drifts is on a contract price per foot of advance, the contract varying with the cross-section of the drift. Stope loaders are required to load 13 cars before leaving the mine. Three contract-shoveling rates are in use, their application depending upon shoveling conditions in individual stopes.

Slushing hoists in use are electrically driven, power being obtained from the 240-volt trolley circuit. Units of 25-hp. are used in stopes under average slushing conditions. Hoists of 10 to 15 hp. are desirable in clean-up work. A hoist of the 2-speed (mechanically controlled) change type on the load line is being

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tried out. It has been found to be particularly desirable in rough material. Slushing hoes in general use are constructed from manganese plates.

Underground Transportation

All main-line haulage is by trolley. Locomotives are of standard 6-ton design. Some are equipped with gathering reels. Trolley wire is of the figure 8 type. It is placed outside of the rail line and is supported by iron pipe hangers from the roof (*Figure 8*). These supports are spaced 10 ft. apart on tangents, closer on curves, as required. All trolley wire is guarded on the track side. At turnouts and cross-overs it is guarded on both sides. Track is bonded by standard flexible track bonds with mechanical connections. Two hundred and forty-volt direct current is used on two levels and 125-volt current on a third level.

Where ore is delivered to cars through chutes on main haulageways, laybys long enough to hold a trip of cars are provided. In drifts or cross-cuts with one draw point only, the cars are spotted in the dead end of the drift by the motor. They are dropped down to the chute, loaded, and passed on to a layby on the haulage side of the chute, where they await the motor. The purpose of this is to minimize hand-tramming. Great care is used in the installation of these features to make easy tramming.

A layby long enough to be a gathering place for cars from all its loading tracks is installed in each open stope.

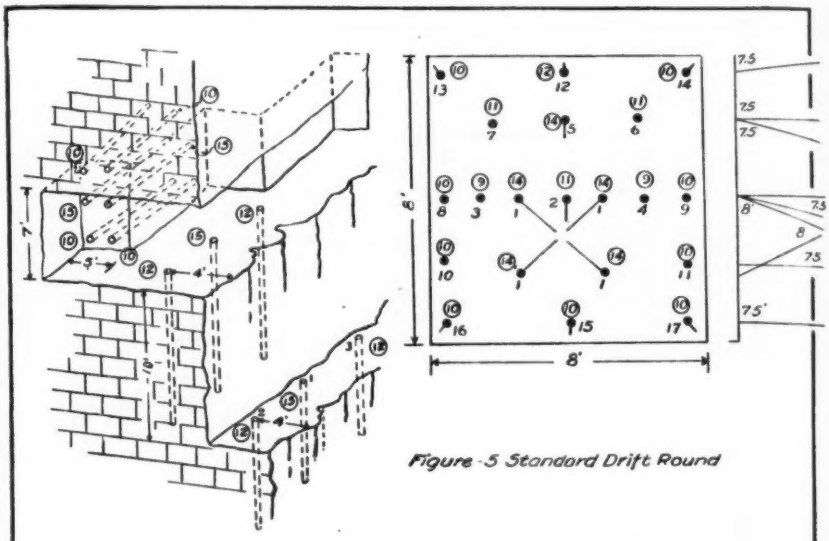

Figure-4 Heading And Bench Method

Figure-5 Standard Drift Round

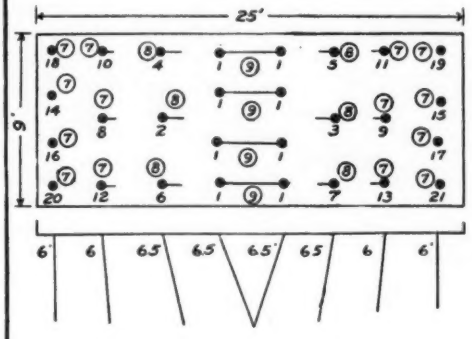

Figure-6 Standard Shaft Round

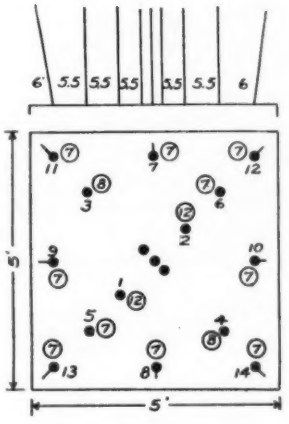

Figure-7 Standard Raise Round

Figure 8. Trolley support

Cars are assembled on such laybys by mule tramming. Each open stope is furnished one mule. A mule driver is used in gathering cars to laybys in such open stopes served by three or more pairs of shovelers. In stopes served by one pair of shovelers only the shovelers do their own driving.

Mill-hole chutes are of steel. The flow of ore into cars is controlled by a hand-operated gate (see *Figure 11*). Jack-hammers are standard equipment at all chutes and blocking is done at the chute gate. Chute openings are 48 in. wide and 36 in. high. Rocks of a size that will pass these gates are readily handled through tipple and skip loading chutes.

All mine cars are of 2-ton capacity. They are of extra-heavy steel construction, being so built as to withstand the heavy duty incident to chute loading of rough and heavy ore (*Figure 9*). They are equipped with 16-in. wheels with outside journal-type bearings (*Figure 10*). In the latter illustration the dimensions given provide for the use of cast iron. If made of cast steel the dimensions indicated by "a" must be used. All dimensions are for finished castings. Steel-incased oak bumper blocks and hook type couplings are used. This type of coupling is believed preferable to other types as regards safety in incline service.

Cars from the lower levels are hoisted to the tipple-level in trips of four over a 22° incline. They are transferred to the tipple by a trolley locomotive, which handles cars from all levels through the tipple.

The tipple is of 2-car capacity. It is oil-controlled and so equipped that it may be operated either by air or by gravity (*Figure 12*). The air-control feature has particular value in holding cars in their dumped position for cleaning.

The tipple delivers into a 750-ton skip pocket, which in turn delivers through chutes into skips. Two skips of 5-ton capacity operate in balance. Skip-pocket chutes are of steel construction. The ore flowage through the chutes into the skips

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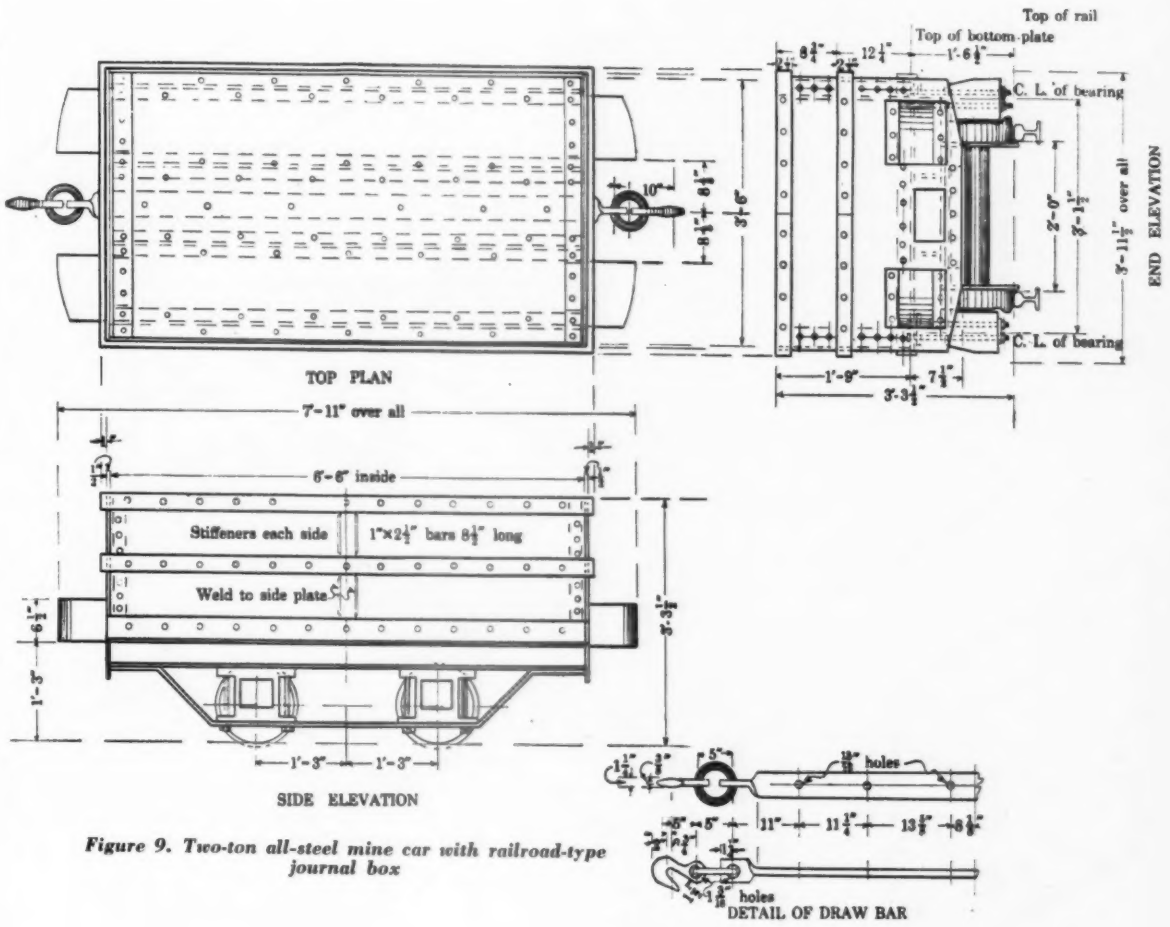

Figure 9. Two-ton all-steel mine car with railroad-type journal box

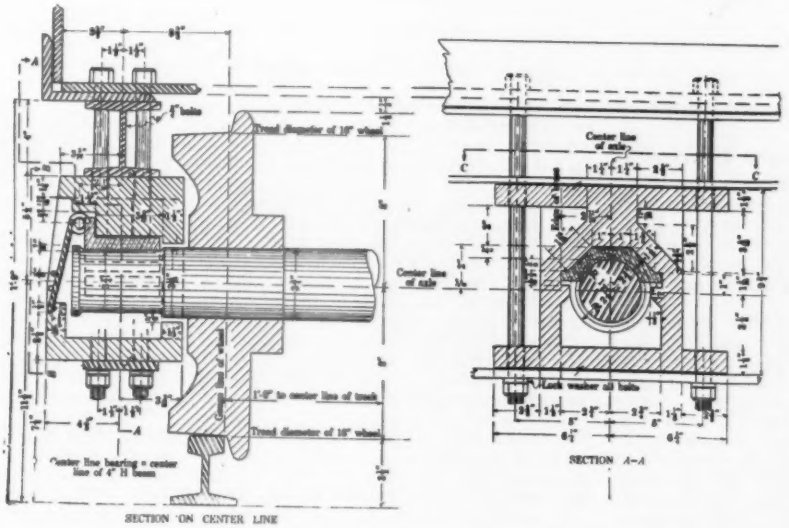

Figure 10. Journal box and bearing for mine cars

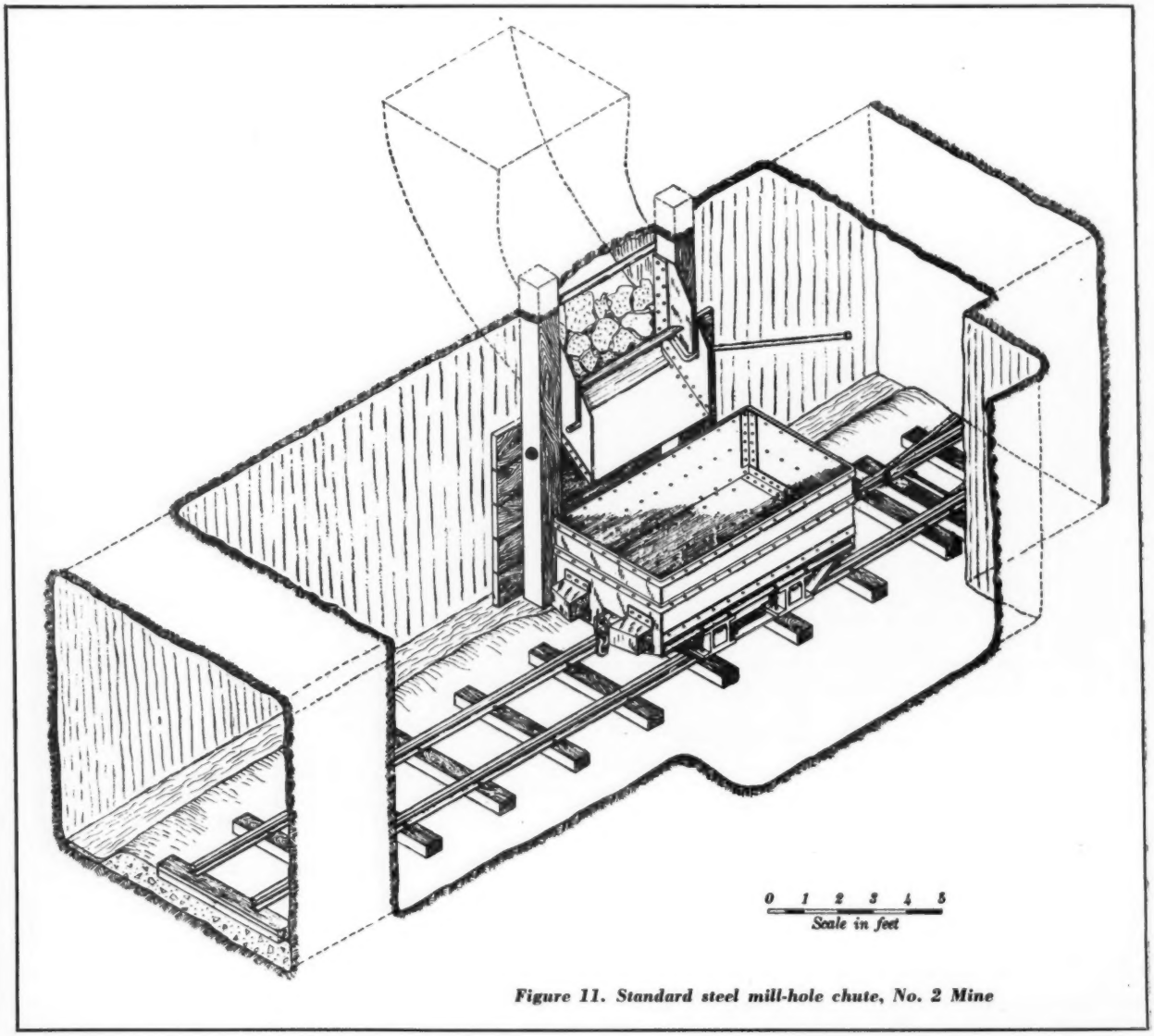

Figure 11. Standard steel mill-hole chute, No. 2 Mine

is controlled by air-operated finger-type gates (*Figure 13*).

Wages, Contracts and Bonuses

Wherever applicable contracting is in effect. Some miscellaneous work of such a nature that it can not very well be contracted for is carried on company time. However, bonuses apply to all company-time work, as will be explained later in this paper.

The mill-hole contractor agrees to break and deliver ore into cars at a stipulated price per ton. The company furnishes drills, drill steel and power; the contractor furnishes labor and explosives. The chute pullers in turn contract with the mill-hole contractor to draw his ore into cars at a price per ton. Settlement is made with the mill-hole contractor each week, all labor, including his chute pulling, and explosive costs are deducted, and the balance earned on the contract is paid him. An itemized statement of his account is furnished him each week.

Contracts in open stopes cover merely breaking and apply only to tonnage made available to shoveling tracks. Open-stope contractors are required to do all blocking for shovelers and to assist them in keeping their working place in good condition.

The contracts carry no guarantee as to earnings. Modifications of contracts are made when, in the judgment of the management, conditions beyond the contractor's control justify change. As a guarantee of the faithful performance of the contract, a holdback of 30 percent is retained by the company until a definite amount has been set up. This holdback is payable to the contractor only upon termination of the contract.

Contractors are responsible for secure roof conditions in their working places. If it becomes necessary, through negligence on the part of the contractor, for the company to do this work, deductions are made from this holdback to cover such expense.

Although most contractors pay their drill men and helpers company-scale wages, they have the privilege of increasing the compensation received by such men. The company sets a limit to the increase. Any such increased pay becomes a part of the contractor's costs and is deducted on his settlement sheets, hence he tends to make such increases sparingly. The system, however, allows the contractor to give recognition where it is deserved.

Development contracts are based upon footage of advance per week. In most instances a definite distance to be driven is specified in such contracts. Usually these are 2-man contracts, and usually both men are drill men. Settlements are made each week, and their earnings are proportioned to the number of shifts each has worked during the week.

Slushing contracts cover breaking, dragging and chute pulling. Payments are made on a tonnage basis, as in other contracts. The contractor supplies all labor and explosives and takes care of all blocking, cable splicing and hoist repairing.

Motor men and motor couplers participate, in proportion to their earnings, in a bonus based upon the total weekly tonnage handled. Skip tenders and helpers participate in a like bonus.

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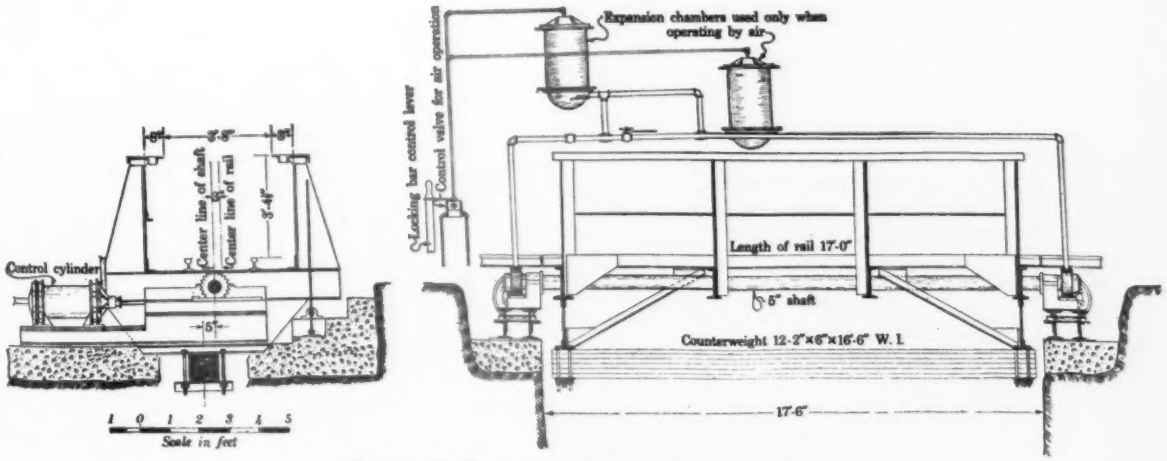


Figure 12. Two-car shaft type rotary car dumper

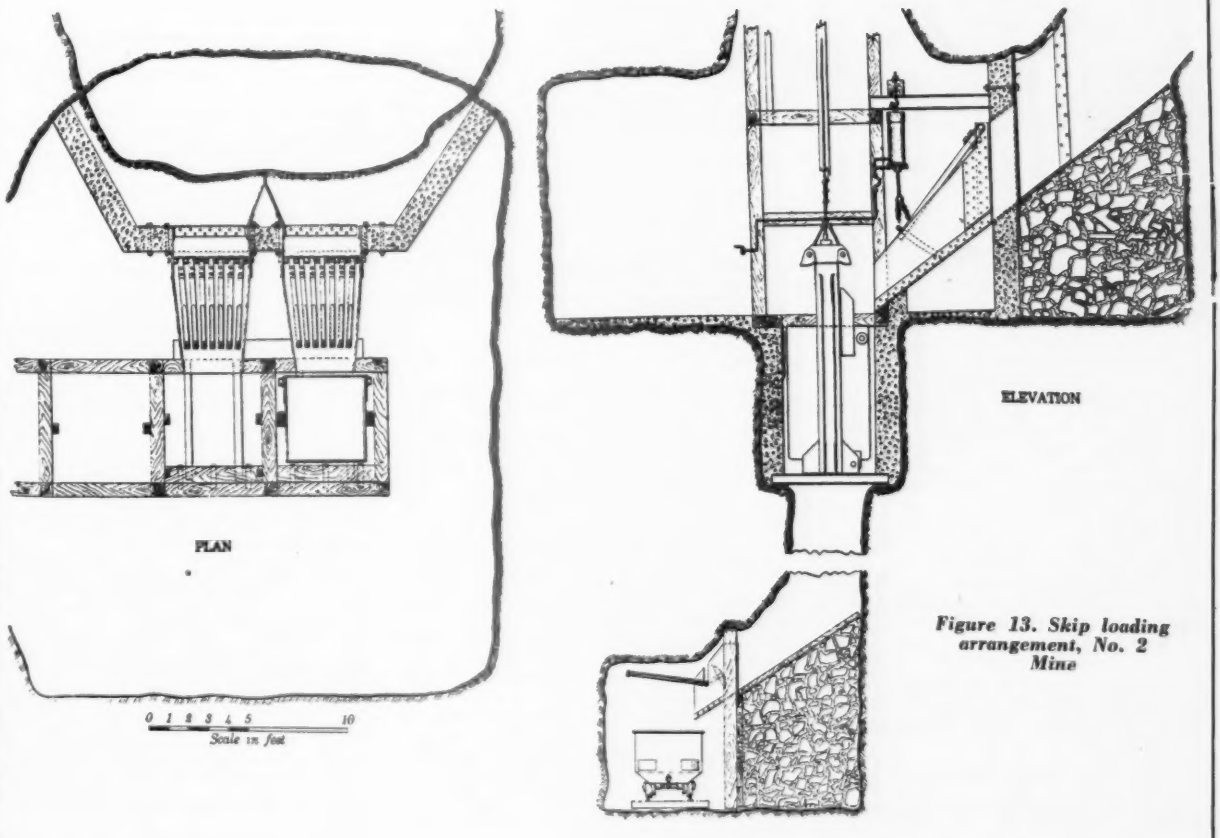


Figure 13. Skip loading arrangement, No. 2 Mine

Stope on the No. Five level, No. Two mine

The day-shift mine foremen participate in a monthly bonus based upon the monthly production of 60 percent zinc concentrates. As the night shift is principally a chute pulling and shoveling shift, the night shift foreman's bonus is based upon total tonnage hoisted.

Ventilation

A 45,000-cu. ft. Buffalo Forge conoidal fan supplies such artificial ventilation as the mine requires. It is located at the collar of No. 4 shaft—a ventilating shaft—about 4,000 ft. from No. 2 shaft. The various working places are so interconnected by stopes, raises, etc., as to provide a good natural circulation. The intake and outlet of the fan are so arranged that the ventilating shaft may be made either an upcast or a downcast, as desired.

Mine Lighting

The shaft station and haulageways are electrically lighted. Workmen furnish their own lamps, but the company supplies carbide.

Drainage

Mine drainage is by open ditches paralleling haulageways. On No. 1 level the drainage is direct to the main sump and pump station at the shaft. Water on the lower levels is ditched likewise to secondary sumps, from which it is either relayed to the main level sump or into flood basins, whose purpose is to store excess water during particularly wet periods, or in case of power failure. Bulkheads of concrete and steel construction in various drifts and cross-cuts throughout the mine supply added protection against heavy inflows of water.

American Zinc, Lead and Smelting Company

ZINC IN THE INDUSTRIES

(*From page* 820)

low coefficient of expansion and good elasticity, essential properties of vitreous enamels. It is used extensively in glazes for ceramic bodies, being a good suspending agent for the raw glaze, aside from imparting desirable effects in the finished glazes. Certain shades in glazes and vitreous enamels can only be satisfactorily produced when the coloring ingredient is used with zinc oxide. It also has a favorable influence on color of white enamels and glazes.

Zinc oxide is used in special glass, such as the modern heat-resisting type and ruby glass for automobile tail-lights and signal lights.

For a more complete appreciation of the widespread use of zinc oxide and its importance to many industries and products it is significant to note additional uses in printing inks, abrasives, celluloid, pharmaceuticals, artificial leather and ivory, glue, matches, polishes, and other items.

Lithopone

Lithopone, produced in this country for over 20 years, is a composite pigment containing approximately 30 percent zinc sulphide and 70 percent barium sulphate. This relative newcomer takes on vital importance to the zinc industry when one considers its growth from 78,365 tons in 1919 to 206,315 tons in 1929.*

It is produced by bringing together in proper molecular proportions very pure solutions of barium sulphide and zinc sulphate, resulting in a double precipitation of the two insoluble components of lithopone, barium sulphate and zinc sulphide. The crude lithopone has no pigment value and must be washed, dried, calcined, quenched in water, dried again, and disintegrated to suitable fineness. It is during the calcination that lithopone takes on properties making it suitable for a pigment, but every step in the operation must be carefully controlled for the production of a successful lithopone with the properties required in paint making.

Great improvement has been made in the quality of lithopone during the past 10 years. At one time it was confined to use in interior paints and enamels because paint products containing it would darken when exposed to sunlight. With the advent of light-resistant lithopones it has found extensive use in exterior paints when used in conjunction with zinc oxide.

Lithopone is a very fine, brilliantly white pigment, has high opacity or hiding power and, like pure zinc oxide, is nonpoisonous. The hiding power of lithopone is due to the zinc sulphide content, a powerful pigment by itself.

More recently so-called high-hiding-power lithopones containing 50 percent zinc sulphide, also pure zinc sulphide, are being produced for pigment purposes. They are well adapted to use in nitro-cellulose lacquers and four-hour drying enamels, which require low pigmentation with a maximum of hiding power.

Lithopone, in addition to the paint industry, is consumed in appreciable quantities in certain types of rubber goods, oilcloth and linoleum, polishes, and leather finishes.

Zinc Salts and By-products

Zinc sulphate is used in the textile industry for its mordant properties, also as an astringent and a fungicide, in addition to being an intermediate product in the manufacture of lithopone. Zinc chloride is used chiefly as a wood preservative, also as a germicide, and in the textile industry. Zinc salts are generally produced from secondary zinc materials, such as dross, scrap, and off-grade zinc oxides.

Indirectly zinc becomes of importance to every chemical industry through the recovery of sulphur in zinc sulphide ores in the form of that very basic by-product, sulphuric acid. Some districts obtain by-product acid from the zinc smelter for the major portion of their requirements, and most zinc companies are also equipped to augment their supply of acid during periods of great demand by burning brimstone. Zinc smelters are a prime factor in marketing sulphuric acid in their respective territories.

Much more could be said regarding zinc, but it is hoped sufficient evidence has been presented to indicate that zinc has played its part, and played it well, in a variety of ways in the advancement

* U. S. Department of Commerce of figures.

of modern industry to its present stage of efficiency in the manufacture of a host of necessities as well as luxuries, which make life more worth while. As time goes on more zinc will be required by present consumers, new uses will be developed by the research organizations within and without the zinc industry, and the producers will be ready to meet every demand. In spite of ups and downs common to most any industry, a commodity so basic, so adaptable to many uses, so vital to our general welfare and happiness can not stand still. Ultimately zinc must go forward.

HISTORY OF ZINC IN TENNESSEE

(*From page 822*)

under the name of Osgood Exploration Company until 1911, when the American Zinc, Lead and Smelting Company took direct charge of the exploration work and organized the American Zinc Company of Tennessee.

In 1911 and 1912 the American Zinc Company of Tennessee acquired the properties formerly operated by the Holston and Kewanee Zinc Companies, and in addition thereto bought about 2,100 acres of land lying east of Flat Creek, on which is now located the American Zinc Company's mines Nos. 2 and 4. From 1912 until 1916, when the American Zinc Company acquired the Roseberry property (Mascot mine No. 3), the zinc company added to its holdings until it now has approximately 2,300 acres of land in Knox County.

In 1913 the American Zinc Company completed its first mill installation, with a daily capacity of 1,000 tons. Additions have been made thereto from time to time, until its present capacity is 2,400 tons per day.

The operations of the American Zinc Company of Tennessee have from the beginning and up to the present time been under unusually able management. From 1911 until 1914 the property was managed by Mr. G. T. Bridgman, of New York City, who has for several years been consulting engineer for Guggenheim Brothers. It was during Mr. Bridgman's management that the properties were explored on a large scale. No. 1 shaft was sunk and the mine developed for operating. The first mill installation of 1,000 tons capacity was built. Mr. Bridgman decided in 1914 to go to San Francisco to engage in some tunnel construction, and when he resigned he was succeeded at Mascot by Mr. J. N. Houser, who for two years had been manager of the American Zinc, Lead and Smelting Company's operations at Carterville, Mo.

Under Mr. Houser's management at Mascot the mines were further developed, the mill capacity increased, and a flotation process worked out for the Mascot ores after this had been declared impossible by experts. In connection with the development of the flotation process at Mascot, the first use was made in the United States of copper sulphate for flotation.

Mr. Houser was manager of the properties throughout the period of the World War, which stimulated production at Mascot and developed a demand for its product which it has ever since held, and is now one of the important mines of the country for production of ores used in making high-grade zinc oxide.

In 1919 Mr. Houser became general manager of the Tennessee Copper Company, and was succeeded as general manager of the American Zinc Company by Mr. Howard I. Young, who had succeeded Mr. Houser as general manager of the American Zinc, Lead and Smelting Company's operations at Carterville, Mo., when Mr. Houser was transferred to Tennessee in 1914.

During the 11 years that Mr. Young has been the general manager of these properties has occurred one of the most trying periods in the history of mining in the United States, but due to his very able management, with the cooperation of his efficient staff at Mascot, the properties have been operated at capacity and on a profitable basis.

About two years ago Mr. Young was elected a director of the American Zinc, Lead and Smelting Company and vice president in charge of operations, which necessitated moving his headquarters from Mascot to the smelters at East St. Louis. During the interim, however, he has acted as manager of the Tennessee properties.

On June 23, 1930, Mr. Young was elected president of the company, succeeding Mr. W. A. Ogg, resigned.

Jarnagin Mine

About three years ago the American Zinc Company of Tennessee took a lease on 450 acres of the Jarnagin farm, lying on the outskirts of Jefferson City (formerly Mossy Creek), in Jefferson County. The company spent about two years drilling the property with core and churn drills, and found a large deposit of low-grade sulphide ores, and last year sank a shaft and opened up the property for mining operations, which were carried on for a few months until the present market conditions caused the operations to be temporarily suspended.

The ore is hoisted through the shaft and loaded into railroad cars and transported by the Southern Railway to the concentrating mills of the company at Mascot.

Universal Exploration Company's Mines

In 1926 the Universal Exploration Company, a subsidiary of the United States Steel Corporation, under the direction and management of Mr. E. E. Ellis, of New York, president of the Exploration Company, began exploring for zinc in Jefferson County in the territory between Newmarket and Jefferson City. This company's exploration operations proved a large deposit of carbonate and sulphide ores, and the company has within the last two or three years purchased several large tracts of land in fee, owning at the present time approximately 1,200 acres. Mining operations have been undertaken on the outskirts of Jefferson City, on property known as the Davis mine.

The company has just finished the construction of an 800-ton concentrating mill, which is the first of three 800-ton units planned for the operation of the Universal Exploration Company's properties.

When this operation gets into full swing it will add considerably to the importance of Tennessee as a zinc-producing state, and to Mr. Ellis must be given credit for the development of this new and important mining district.

Other Mines and Prospects

No attempt will here be made to describe in detail the history of other mines and prospects in Tennessee which have intrigued not only experienced miners but tyros as well.

Anyone interested in pursuing that subject will find detailed descriptions of these in Tennessee Division of Geology Bulletin No. 31, entitled "Zinc Deposits of Tennessee," by Mark H. Secrist, published at Nashville, Tenn., in 1924.

GEOLOGY AT MASCOT

(*From page 823*)

cases connections between ore bodies are present. The bottom almost invariably is some marbleized brown limestone bed. The top and sides are limited to points where decreasing values dictate that mining must stop. Values usually are more or less commensurate to the degree of fracturing. In exceptional cases thicknesses of as much as 100 ft. or more have been mined. Widths are variable—125 to 150 ft. perhaps is about average for ore bodies with particularly long dimensions.

The ore is sphalerite. The gangue consists of the body of the marbleized brown limestone, the dolomitic country rock (brecciated or shattered material) and a later crystalline dolomite with which the sphalerite appears between the breccia fragments and in cracks and seams. The crystalline dolomite is believed to be in part opening filler and in part replacement of country rock dolomite. Marcasite and chert are present as subordinate gangue minerals. The brecciated or shattered type is the most important source of ore. Such marbleized beds as may be directly in contact with that type usually are ore bearing at localities of contact.

In the brecciated or shattered phases sphalerite commonly occurs as irregular seams with country rock dolomite on one side and the crystalline dolomite on the other. In the marbleized phase the sphalerite is disseminated. It is believed that the ore mineral in both types is largely replacement of dolomite—in the case of disseminated ores in marbleized limestone, of dolomite crystals—in case of the shattered type, of crystalline dolomite and to a less degree of country rock dolomite. Amount of sphalerite present appears to depend to a considerable degree upon type and extent of breaking and exhibits irregularities such as would be expected under such conditions. Usually, though not always, the lower third of an ore body is of higher grade than either of the upper two-thirds. This is due in part to the higher grade habit of the disseminated type which commonly appears at the bottom and in part to the more general breaking that is characteristic of the intermediate and lower horizons of the shattered type. Marcasite, where present, usually is more abundant in the upper than in the lower parts of the ore body. Chert is in small amount—it may be present at any horizon, but probably is somewhat more abundant in the lower part of the ore body.

Zinc content of individual ore bodies differ, much as the zinc content of individual stopes differ. No definite change in trend as to size or grade of ore bodies with depth has been noted throughout the vertical mining range of about 800 ft. The min- (*Continued on page 855*)

American Zinc, Lead and Smelting Company

MILLING METHODS

of the American Zinc Company of Tennessee, at Mascot

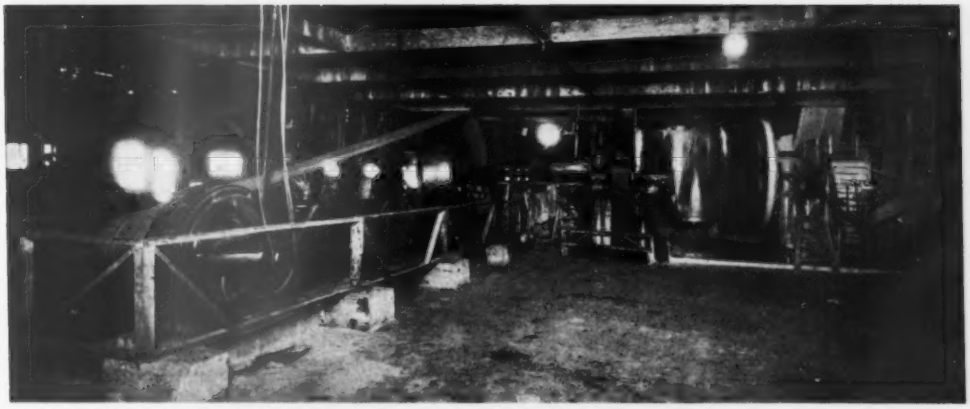
THE Mascot property of the American Zinc Company of Tennessee is located 13 miles east of Knoxville on the Southern Railroad at Mascot, Knox County, Tenn. The concentrator has a capacity of 80 tons per hour, and the flow sheet includes treatment by jigging and flotation, approximately 50 percent of the mill feed being discarded as a coarse jig tailing and disposed of as ballast, and the balance of the ore is ground for flotation. Of the total concentrates produced, one-third is jig concentrate and two-thirds flotation concentrate. The majority of the ore treated is hoisted on the Mascot property, but some ore is shipped in from adjoining developments and milled along with the ore hoisted from the local shafts.

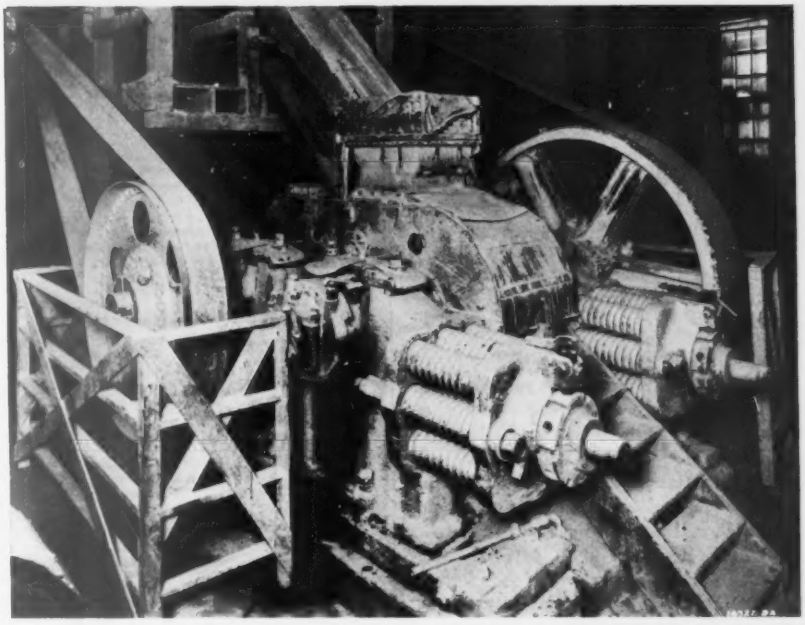
The zinc mineral is a straw-colored sphalerite found in the Knox dolomite, and with it are associated small amounts of calcite, pyrite and quartz. Pyrite is present in small quantities, usually less than 0.5 percent; quartz occurs in bands of a few inches thick. A typical analysis of the ore as mined is as follows:

	Percent
Calcium carbonate.....	48.11
Magnesium carbonate...	35.36
Silica	8.73
Alumina	1.04
Iron oxide.....	1.33
Zinc sulphide.....	5.43
Cadmium sulphide.....	Nil
Lead sulphide.....	Nil
Total.....	100.00

* General Superintendent, American Zinc Co., of Tennessee, Mascot, Tenn.

Above, view of Cooley type rougher and bull jigs. Left, Janney flotation cells.





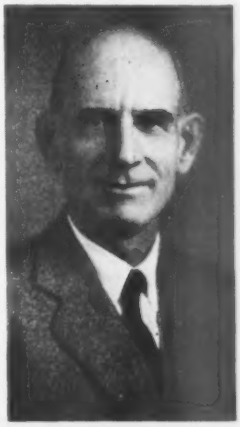
By **Charles Booth Strachan***

History

The concentrator as originally built was of the Missouri type, consisting of Cooley type Harz jigs and Wilfley tables. The original installation included a larger number of concentrating tables than is usually found in the old-type Joplin mill. The first mill was started in May, 1913, with a capacity of 30 tons per hour, and operated on a feed which carried better than 4 percent zinc with a recovery of 64 percent. In November, 1914, a flotation unit was started using Butte Superior type flotation machines. This unit treated approximately 20 percent of the feed to the gravity plant, and its recovery of 85 percent increased the total milling recovery to approximately 75 percent. In 1922 the General Engineering Company of Salt Lake City, Utah, conducted experiments on the use of TT mixture with very gratifying results, increasing the flotation recovery from 85 to 98 percent. Later in the year dry carbanilid was substituted for the TT mixture, resulting in better operating conditions with the same metallurgical work. The flow sheet in the gravity mill was then changed to eliminate concentrating tables entirely by increasing the fine grinding capacity and sending material formerly treated on tables to the flotation unit. This development raised the total metal recovery to 90 percent with approximately one-half of the total mill feed going to the flotation unit. In the year 1929 operating on a 2.9 percent zinc head, 90.15 percent of the total zinc was recovered in a concentrate assaying 60.19 percent zinc.

Coarse and Fine Crushing

The ore from No. 2 mine shaft is crushed as hoisted to a maxi-



C. B. Strachan

At top, rod mill grinding unit. Center, 20 in. by 54 in. Garfield rolls. Right, gyratory crusher and feeder.

mum size of 2 in. by means of a Gyratory and Symons horizontal disc crushers in open circuit. The crushed ore is trammed to the concentrator on an automatic continuous tramway where the ore is reduced in rolls to minus ⅝-in. size, ready for the gravity mill concentration. At the head of the gyratory crusher, tramway loading terminal and tramway discharge terminal are relatively small bins which act as surge bins in the flowing of the ore from the mine shaft to mill feed bins. The average crushing rate for reducing to 2-in. size is 98.6 tons per hour, while the Garfield rolls reduce this 2-in. ore to ⅝-in. undersize at the rate of 103 tons per hour per set of rolls.

All ore shipped in from outlying developments is brought to the concentrator in hopper bottom standard gauge railroad cars, which are dumped over a mine raise, hoisted through the mine shaft, and crushed to mill feed in a crushing plant immediately adjacent to the gravity mill.

Table No. 1 shows the degree of crushing performed by the Gyratory and Symons crushers.

Table No. 2 shows a complete screening test on the ore delivered to the concentrator.

Jigging Department

The ore is drawn from the mill storage bin by oscillating tray feeders onto a conveyor belt equipped with a Merrick weightometer. To the discharge of the conveyor, water is added, and the pulp delivered to the series of Cooley jigs. The hutch of the first jig is concentrated on cleaner jigs into a 60 percent concentrate and a tailing which is ground for flotation. Tailings from the first or rougher jig are sent over short Cooley jigs, and the tailings from these jigs are sold for ballast after being dewatered. The middlings from both the rougher and the tailing jigs are reground to approximately ⅛-in. through a set of rolls using manganese steel shells in closed circuit with a Hummer vibrating screen. The crushed middlings are then sent over sand jigs, the hutch of these jigs joining the hutch from the original or rougher jigs at the cleaner jigs. The tailings from the sand jigs join the tailings from the cleaner jigs and are reground for flotation feed.

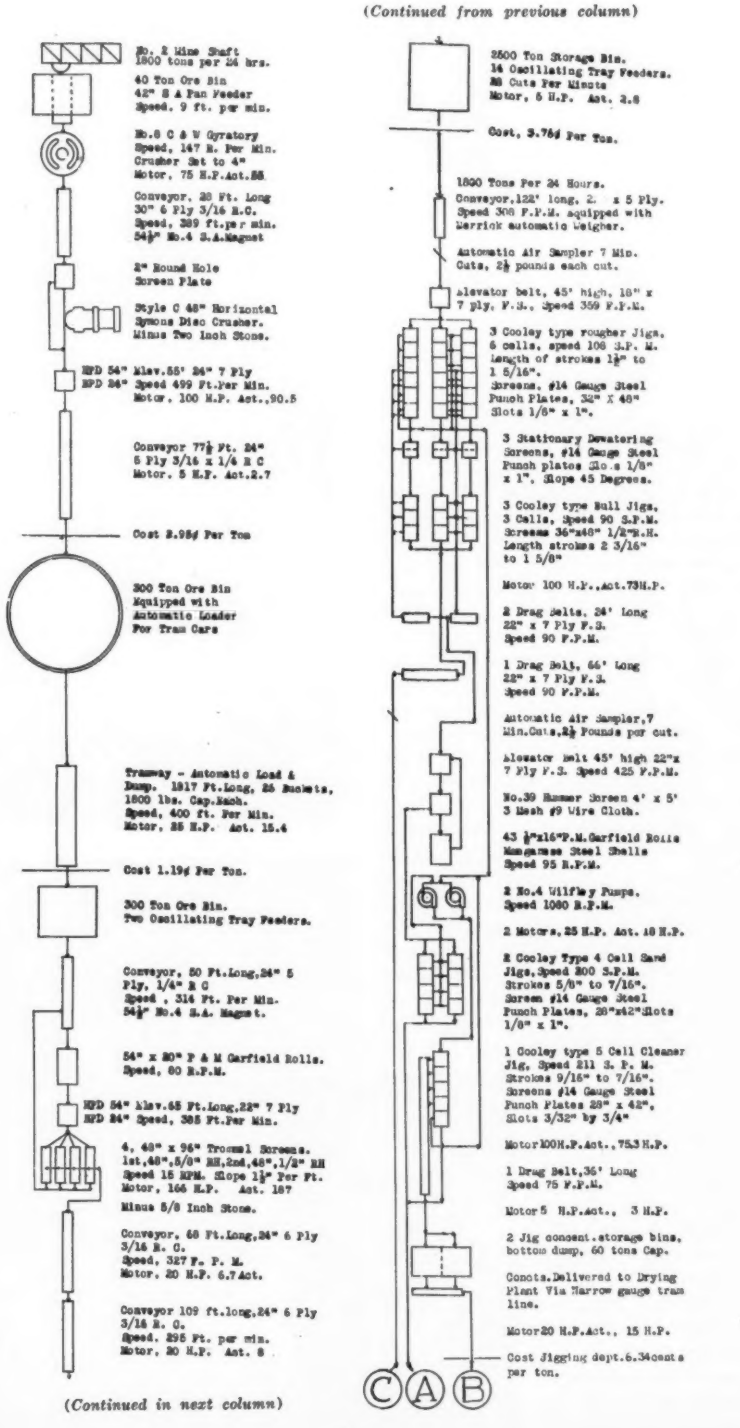
Jig tailings are dewatered by a drag belt and elevated to a flume which delivers product to the storage pile or to the railroad cars for loading. Jig concentrates are dewatered by drag belt and delivered to bins whence they are delivered by gravity tramway to the concentrate drying plant.

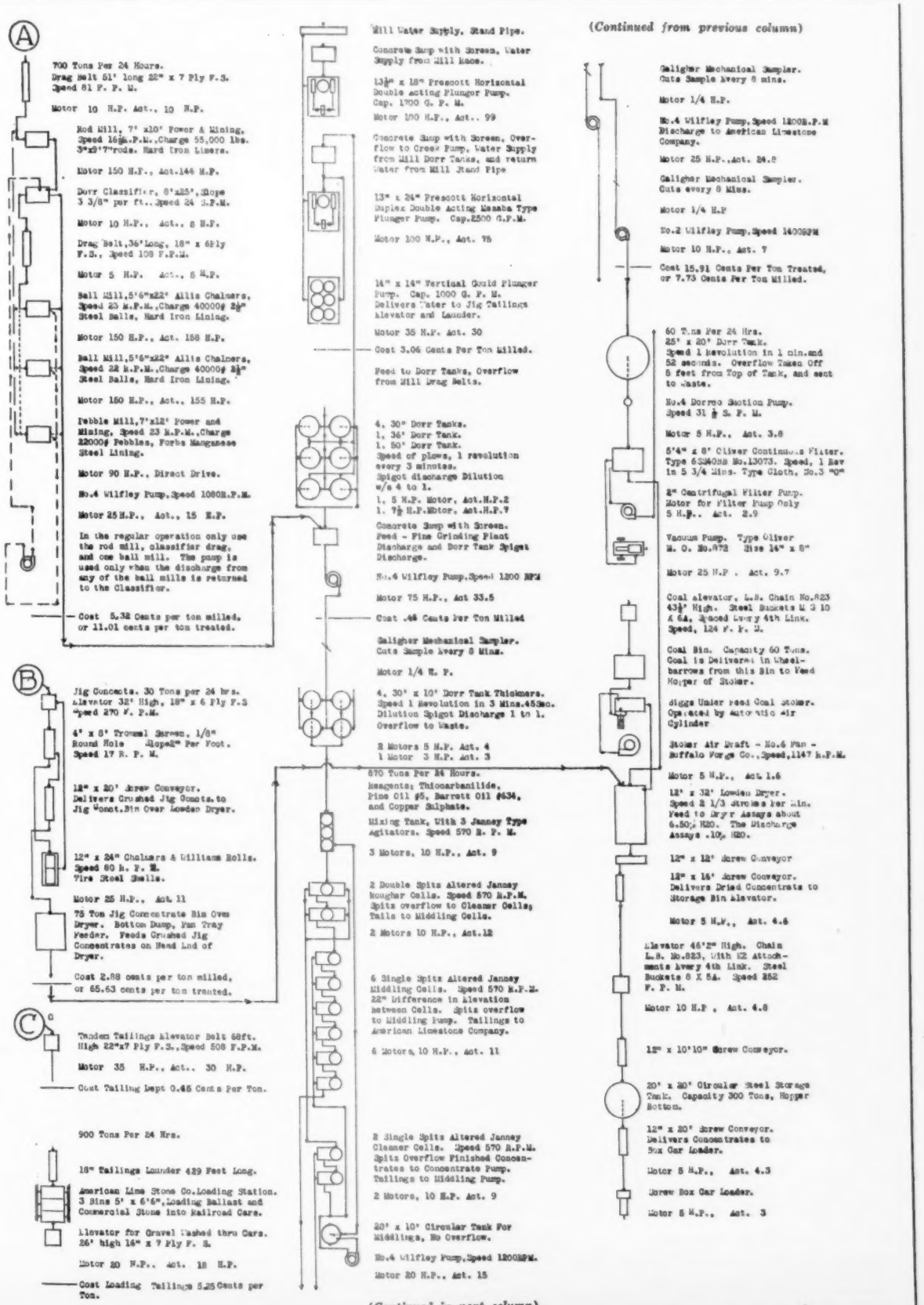
Table No. 3 shows the screen analysis of the jig tailings.

Table No. 4 shows the analysis of the jig concentrate.

FLOW SHEET

American Zinc Company of Tennessee





Tables No. 5 and 6 show the analysis of the cleaner jig and sand jig tailings.

Fine Grinding Department

The various dewatered products from the jigging department are delivered to a rod mill whose discharge is received by a heavy-duty Dorr classifier. The sands from the Dorr classifier are crushed in one of two ball mills in open circuit, the discharge going direct to the flotation plant. In the grinding operation the rod mill always receives the original feed and any one or a number of the remaining mills are used for the finishing grind, the attempt always being made to keep the +100 mesh in the flotation feed under 30 percent.

Table No. 7 is descriptive of the grinding equipment, with data on the grinding media and liners.

Table No. 8 gives screen analysis of the products in the grinding plant.

The overflow water from the six Dorr tanks at the gravity mill is pumped to a standpipe into which also discharges the

TABLE NO. 1.—SCREEN SIZES OF COARSE CRUSHING PLANT PRODUCTS

Screen size	Gyratory discharge Pct. wt.	Gyratory discharge Cum. pct. wt.	Symons discharge Pct. wt.	Symons discharge Cum. % wt.
On 5-in.	7.9	7.9	.....	.....
On 4½-in.	6.1	14.0	.....	.....
On 4-in.	9.4	23.4	.....	.....
On 3½-in.	12.7	36.1	.....	.....
On 3-in.	9.0	45.1	.....	.....
On 2½-in.	10.4	55.5	.....	.....
On 2-in.	10.0	65.5	.....	.....
On 1¾-in.	4.5	70.0	17.9	17.9
On 1½-in.	3.5	73.5	10.9	28.8
On 1¼-in.	3.9	77.4	16.4	45.2
On 1-in.	4.6	82.0	12.7	57.9
On ½-in.	7.4	89.4	19.8	77.7
On 9.423 m.m.	0.9	90.3	2.7	80.4
On 3-mesh.	2.4	92.7	4.5	84.9
On 6-mesh.	2.8	95.5	5.2	90.1
Through 6-mesh	4.5	100.0	9.9	100.0
Totals	100.0	100.0	100.0	100.0

Gyratory discharge is Symons feed.

TABLE NO. 3.—TOTAL JIG TAILS

Screen size	Solids Pct. weight	Solids Cum. pct. weight
8	51.9	51.9
6	39.1	91.0
10	7.4	98.4
—10	1.6	100.0
Total	100.0	100.0

TABLE NO. 2.—MILL FEED

Screen size	Solids Pct. weight	Solids Cum. % weight	Zinc Assay % zinc	Zinc Cum. assay % zinc	Zinc Pct. total zinc	Zinc Cum. % tot. zinc	Iron Assay pct. fe.	Iron Cum. assay pct. fe.	Iron Pct. tot. fe.	Iron Cum. % tot. fe.
3	30.5	30.5	1.95	1.95	18.4	18.4	.67	.67	30.7	30.7
6	28.9	59.4	2.55	2.24	22.9	41.3	.75	.71	32.6	63.3
10	11.1	70.5	3.42	2.48	11.8	53.1	.70	.71	11.6	74.9
20	9.2	79.7	4.35	2.65	12.4	65.5	.62	.70	8.6	83.5
35	5.6	85.3	5.50	2.84	9.5	75.0	.57	.69	4.8	88.3
65	4.2	89.5	5.85	2.98	7.6	82.6	.57	.68	3.6	91.9
100	2.3	91.8	5.90	3.05	4.2	86.8	.55	.68	1.9	93.8
150	1.1	92.9	5.90	3.08	2.0	88.8	.55	.68	.9	94.7
200	1.5	94.4	5.65	3.13	2.6	91.4	.47	.67	1.1	95.8
—200	5.6	100.0	4.95	3.23	8.6	100.0	.50	.67	4.2	100.0
Total	100.0	100.0	3.23	3.23	100.0	100.0	.67	.67	100.0	100.0

TABLE NO. 5.—CLEANER JIG TAILS

Screen size	Solids Pct. weight	Solids Cum. % weight	Zinc Assay % zinc	Zinc Cum. assay % zinc	Zinc Pct. total zinc	Zinc Cum. % tot. zinc	Iron Assay pct. fe.	Iron Cum. assay pct. fe.	Iron Pct. tot. fe.	Iron Cum. % tot. fe.
6	2.4	2.4	3.10	3.10	1.6	1.6	.55	.55	2.2	2.2
10	15.7	18.1	2.95	2.97	10.0	11.6	.62	.61	16.4	18.6
20	30.1	48.2	2.85	2.89	18.5	30.1	.65	.64	33.0	51.6
35	19.1	67.3	4.50	3.35	18.5	48.6	.57	.62	18.4	70.0
65	23.3	90.6	6.20	4.08	31.1	79.7	.55	.60	21.6	91.6
100	4.6	95.2	8.95	4.32	8.8	88.5	.52	.59	4.0	95.6
150	2.2	97.4	11.70	4.49	5.5	94.0	.50	.59	1.9	97.5
200	1.3	98.7	11.65	4.58	3.3	97.3	.52	.59	1.1	98.6
—200	1.3	100.0	9.80	4.65	2.7	100.0	.62	.59	1.4	100.0
Total	100.0	100.0	4.65	4.65	100.0	100.0	.59	.59	100.0	100.0

TABLE NO. 6.—SAND JIG TAILS

Screen size	Solids Pct. weight	Solids Cum. % weight	Zinc Assay % zinc	Zinc Cum. assay % zinc	Zinc Pct. total zinc	Zinc Cum. % tot. zinc	Iron Assay pct. fe.	Iron Cum. assay pct. fe.	Iron Pct. tot. fe.	Iron Cum. % tot. fe.
6	7.4	7.4	2.85	2.85	8.6	8.6	.85	.85	9.7	9.7
10	30.2	37.6	2.10	2.25	25.8	34.4	.72	.74	33.5	43.2
20	29.0	66.6	1.80	2.05	21.3	55.7	.67	.71	29.9	73.1
35	8.5	75.1	2.15	2.06	7.5	63.2	.52	.69	6.7	79.8
65	5.7	80.8	2.15	2.07	5.0	68.2	.55	.68	4.8	84.6
100	3.8	84.6	2.55	2.09	4.0	72.2	.50	.67	2.9	87.5
150	2.7	87.3	3.67	2.14	4.0	76.2	.45	.66	1.9	89.4
200	3.7	91.0	4.70	2.24	7.1	83.3	.47	.66	2.7	92.1
—200	9.0	100.0	4.55	2.45	16.7	100.0	.57	.65	7.9	100.0
Total	100.0	100.0	2.45	2.45	100.0	100.0	.65	.65	100.0	100.0

TABLE NO. 4.—JIG CONCENTRATES

Screen size	Solids Pct. weight	Solids Cum. pct. weight	Zinc Assay pct. zinc	Zinc Cum. assay pct. zinc	Zinc Pct. total zinc	Zinc Cum. pct. total zinc	Iron Assay pct. fe.	Iron Cum. pct. fe.	Iron Pct. total fe.	Iron Cum. pct. total fe.	Lime Assay pct. CaO	Lime Cum. pct. CaO	Lime % tot. CaO	Lime Cum. % tot. CaO
6	8.7	8.7	56.00	56.00	8.2	8.2	2.90	2.90	10.8	10.8	3.35	3.35	14.0	14.0
10	42.4	51.1	58.00	57.66	41.7	49.9	2.40	2.49	43.7	54.5	2.65	2.77	53.8	67.8
20	34.1	85.2	61.40	59.16	35.4	85.3	1.80	2.21	26.3	80.8	1.10	2.10	18.0	85.8
35	10.9	96.1	61.40	59.30	11.1	96.4	2.50	2.24	11.7	92.5	1.50	2.03	7.7	93.5
65	2.8	98.9	54.80	59.17	2.6	99.0	4.40	2.30	5.3	97.8	3.10	2.06	4.2	97.7
—65	1.1	100.0	51.20	59.08	1.0	100.0	4.70	2.33	2.2	100.0	4.40	2.09	2.3	100.0
Total	100.0	100.0	59.08	59.08	100.0	100.0	2.33	2.33	100.0	100.0	2.09	2.09	100.0	100.0

TABLE NO. 7.—SHOWING REGULAR OPERATING CONDITION AND EQUIPMENT

Machine	Size and type	Speed	Charge in mill	Kw.	Tons per 24 hours		Dilution W/S
Rod mill	7 ft. x 10 ft. power and mining.	16½ r. p. m.	55,000 pounds 2½-in. diameter steel rods	111.5	695.3		2.53
Classifier	8 ft. x 25 ft. Dorr slope 3⅜ in. per ft.	24 s. p. m.	.....	.....	Overflow	212.0	0.58
					Rake returns	483.3	....
Drag belt	18 in. by 6-ply slope 6 in. per ft.	118 f. p. m.	.....	.....	Overflow	52.4	0.08
					Discharge	430.9	....
Ball mill	5½ ft. x 22 ft. Allis Chalmers.	23 r. p. m.	40,000 pounds 2½-in. diameter steel balls	117.9		430.9	2.63

GRINDING MEDIA AND LINER DATA

Type of rods used—2½ in. by 9 ft. 7 in., steel rods.
Rate of consumption—.307 pounds per ton of product ground, or a cost of $0.0078 per ton.
Type of balls used—2½-in. steel balls.
Rate of consumption—.6575 pound per ton ground, or a cost of $0.023 per ton.
Taken collectively, the total grinding media consumption cost is $0.0284 per ton of product ground to flotation size.
Type of lining used—Hard iron. Total cost $0.0069 per ton of product ground to flotation size.

American Zinc, Lead and Smelting Company

TABLE NO. 8.—SCREEN ANALYSIS FINE GRINDING PLANT PRODUCTS

Screen size	7-ft. x 10-ft. power and mining rod mill feed: Pct. weight	7-ft. x 10-ft. power and mining rod mill feed: Cum. pct. weight	Rod mill discharge: Pct. weight	Rod mill discharge: Cum. pct. weight	Screen size	Dorr classifier overflow: Pct. weight	Dorr classifier overflow: Cum. pct. weight	Dorr classifier rake returns: Pct. weight	Dorr classifier rake returns: Cum. pct. weight
6-mesh	6.5	6.5	.....	.....	10-mesh	.....	.....	0.8	0.8
10	34.5	41.0	0.4	0.4	20	.....	.....	13.0	13.8
20	25.4	66.4	6.8	7.2	35	2.3	2.3	36.0	49.8
35	18.5	84.9	22.4	29.6	65	15.0	17.3	25.3	75.1
65	10.8	95.7	21.8	51.4	100	17.2	34.5	9.4	84.5
100	3.1	98.8	12.3	63.7	150	11.9	46.4	4.4	88.9
150	0.8	99.6	7.2	70.9	200	13.5	59.9	2.9	91.8
200	0.2	99.8	6.8	77.7	325	9.9	69.8	3.0	94.8
325	0.1	99.9	6.6	84.3	—325	30.2	100.0	5.2	100.0
—325	0.1	100.0	15.7	100.0					
Total...	100.0	100.0	100.0	100.0		100.0	100.0	100.0	100.0

Screen size	Drag belt overflow: Pct. weight	Drag belt overflow: Cum. pct. weight	Drag belt discharge: Pct. weight	Drag belt discharge: Cum. pct. weight	5-ft. 6-in. x 22-ft. Allis Chalmers ball mill feed: Pct. weight	5-ft. 6-in. x 22-ft. Allis Chalmers ball mill feed: Cum. pct. weight	Ball mill discharge: Pct. weight	Ball mill discharge: Cum. pct. weight
10-mesh	.....	.....	0.9	0.9	0.9	0.9	0.0	0.0
20	.....	.....	12.7	13.6	12.7	13.6	.....	.....
35	.....	.....	40.0	53.6	40.0	53.6	4.2	4.2
65	0.7	0.7	30.0	83.6	30.0	83.6	17.8	22.0
100	5.9	6.6	9.4	93.0	9.4	93.0	16.6	38.6
150	12.1	18.7	3.3	96.3	3.3	96.3	11.2	49.8
200	17.7	36.4	1.4	97.7	1.4	97.7	10.6	60.4
325	19.2	55.6	1.0	98.7	1.0	98.7	10.0	70.4
—325	44.4	100.0	1.3	100.0	1.3	100.0	29.6	100.0
Total...	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TABLE NO. 9.—FLOTATION FEED

Screen size	Solids: Pct. weight	Solids: Cum. % weight	Zinc: Assay % zinc	Zinc: Cum. assay % zinc	Zinc: Pct. total zinc	Zinc: Cum. % tot. zinc	Iron: Assay pct. fe.	Iron: Cum. assay pct. fe.	Iron: Pct. tot. fe.	Iron: Cum. % tot. fe.
35.....	1.7	1.7	2.00	2.00	1.0	1.0	.70	.70	2.5	2.5
65.....	11.7	13.4	2.85	2.74	9.6	10.6	.52	.54	12.7	15.2
100.....	14.4	27.8	3.00	2.88	12.5	23.1	.45	.49	13.5	28.7
150.....	10.0	37.8	3.55	3.05	10.3	33.4	.42	.47	8.7	37.4
200.....	13.4	51.2	3.90	3.28	15.1	48.5	.42	.46	11.7	49.1
—200.....	48.8	100.0	3.65	3.46	51.5	100.0	.50	.48	50.9	100.0
Total...	100.0	100.0	3.46	3.46	100.0	100.0	.48	.48	100.0	100.0

TABLE NO. 10.—FLOTATION RAILS

Screen size	Solids: Pct. weight	Solids: Cum. % weight	Zinc: Assay % zinc	Zinc: Cum. assay % zinc	Zinc: Pct. total zinc	Zinc: Cum. % tot. zinc	Iron: Assay pct. fe.	Iron: Cum. assay pct. fe.	Iron: Pct. tot. fe.	Iron: Cum. % tot. fe.
65.....	14.4	14.4	.15	.15	24.4	24.4	.57	.57	18.1	18.1
100.....	15.2	29.6	.09	.12	15.5	39.9	.45	.51	15.1	33.2
150.....	11.7	41.3	.07	.10	9.3	49.2	.40	.47	10.3	43.5
200.....	9.8	51.1	.06	.09	6.6	55.8	.37	.46	8.0	51.5
—200.....	48.9	100.0	.08	.09	44.2	100.0	.45	.45	48.5	100.0
Total...	100.0	100.0	.09	.09	100.0	100.0	.45	.45	100.0	100.0

Wilfley pumps are used throughout the entire plant for the handling of concentrates, tailings, jig hutches and grinding plant product.

Tables No. 9, 10 and 11 show the analysis of flotation plant products.

Concentrate Handling

Flotation concentrates are thickened to 60 percent solids in a Dorr tank and filtered to 7½ percent moisture on an Oliver filter. This filter feed is delivered from the filter on to the Lowden drier which delivers a dried product carrying .10 percent moisture. The jig concentrate brought from the gravity mill is crushed through 10 mesh by means of rolls and uniformly added to the flotation concentrate filter cake at the Lowden drier. The drier is coal fired by means of a Biggs under feed stoker. The dried concentrate is then loaded in box cars for shipment.

TABLE NO. 11.—FLOTATION CONCENTRATES

Screen size	Solids: Pct. weight	Solids: Cum. pct. weight	Zinc: Assay pct. zinc	Zinc: Cum. assay pct. zinc	Zinc: Pct. total zinc	Zinc: Cum. pct. total zinc	Iron: Assay pct. fe.	Iron: Cum. pct. fe.	Iron: Pct. total fe.	Iron: Cum. pct. total fe.	Lime: Assay pct. CaO	Lime: Cum. pct. CaO	Lime: % tot. CaO	Lime: Cum. % tot. CaO
65.....	5.3	5.3	60.80	60.80	5.2	5.2	.40	.40	1.5	1.5	2.40	2.40	9.0	9.0
100.....	13.8	19.1	59.60	59.93	13.4	18.6	.70	.62	6.7	8.2	2.55	2.73	28.0	37.0
150.....	11.5	30.6	60.80	60.26	11.4	30.0	1.20	.84	9.6	17.8	1.90	2.41	15.6	52.6
200.....	13.6	44.2	62.20	60.85	13.8	43.8	1.30	.98	12.3	30.1	1.20	2.04	11.6	64.2
—200.....	55.8	100.0	62.00	61.50	56.2	100.0	1.80	1.44	69.9	100.0	.90	1.40	35.8	100.0
Totals..	100.0	100.0	61.50	61.50	100.0	100.0	1.44	1.44	100.0	100.0	1.40	1.40	100.0	100.0

fresh water supply at the rate of 1,700 gallons per minute.

Flotation

The total feed for the flotation plant is delivered into Dorr thickeners where it is thickened to approximately 50 percent solids, the overflow from the thickening tanks being sent to waste, and is practically clear water all the time. The flotation reagents are incorporated into thick pulp which is then delivered to modified Janney gravity cells, the froth from the first two machines being delivered to the cleaners, and the froth from the balance of the cells is delivered back to the new feed along with the cleaner tailings. Thiocarbanilid, No. 5 pine oil and copper sulphate are added to the preliminary mixer and a small amount of pine oil and No. 634 Barrett oil is added near the last tailing machine. The tailings from the flotation plant are pumped to the American Limestone Company where it is dried for use as Dolomitic limestone. Concentrates are pumped to the concentrate drying plant.

Acknowledgment is made to M. H. Newman, geologist; Robert Ammon, chief metallurgist; D. B. Grove, mill foreman; and W. A. Calhoun, metallurgical clerk for assistance in preparation of this paper.

American Zinc, Lead and Smelting Company

Hand or stope loading. This shows safe practice inasmuch as the shovelers are wearing goggles while boulders are being broken. The angle of the stope is sufficiently flat to prevent slide of ore and the working place adjacent to the track is clear

Personnel, Safety and Accident Prevention at Mascot

FROM the sinking of the first shaft in Mascot, the policy of the company has been to pick the very best material in the form of man power possible. In the beginning men came from other fields, but as time passed and the mines developed, it has been our policy to build up the personnel from men trained here. With but one or two exceptions, all of the department heads are men who have been with the company more than 15 years. Most of the foremen started with day-pay jobs and worked their way to the positions they now hold. This means that they are thoroughly familiar with the task of their men, know the policy of the company and are loyal.

The employes of the American Zinc Company of Tennessee are 100 percent American, 90 percent being white and 10 percent negroes. With but very few exceptions, our best miners are natives from this district, coming from the farm, where some of them still make their homes, going to and from work daily.

EMPLOYMENT

All labor is handled through a central labor office where applicants are interviewed to determine their fitness for the job they seek. If the new man has the appearance of making a satisfactory employe he is sent to the medical department for a physical examination. If he passes the physical requirements for the job he is seeking, he is then registered at the employment office and given a clearance ticket entitling him to a job. He is also handed a safety rule book and directed to the foreman under whom he is to work.

Safe haulageway. Walkways on both sides of the track are clear, ditches are open, trolley boards are in place and the general appearance is for safety

* Director of Personnel, American Zinc Company of Tennessee, Mascot, Tenn.

By **P. M. Arthur***

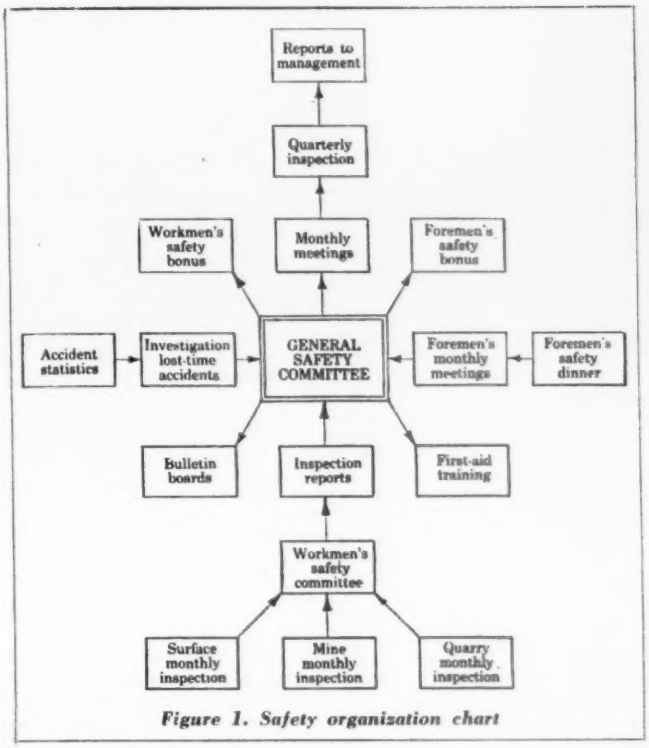


Figure 1. Safety organization chart

When a foreman wishes to lay off a man, he issues what is known as a discharge ticket, giving the reason for the lay off and an entry is made on the employe's registration card showing this information. Should this same man return for work after having previously been discharged for the breaking of any rule, he would not be re-hired until the foreman for whom he had previously worked approved of his return. By this method we eliminate an undesirable man from re-entering our employ.

Transfers from one department to another are permitted only by approval of the employment office. This eliminates employes shifting from one job to another for trivial reasons and also protects the foreman, inasmuch as the men know that they can not get a job from another foreman unless they satisfy their present foreman.

The employment or labor department is the clearing house of the plant and it is the desire of this department to gain the confidence of all employes so they can feel free to discuss any of their problems and be directed where to go and whom to see for information not available at the employment department.

WELFARE

In a community where customary civic organizations are not available, it is necessary to have some method of looking after the needs of the employes and their families. Schools and churches are provided with suitable buildings and they have financial help from the company. Lodges help hold the people together and increase interest in the community. The company also maintains a baseball park, tennis courts and swimming facilities. There are also community halls where both white and colored employes can hold their entertainments and social gatherings.

A year ago the employes started and organized a community chest, contributing voluntarily approximately $2,500. During this period about $1,200 has been donated to needy families or individuals, not only employes of the company, but to outsiders living in our community. At Christmas, the chest contributed financially and supervised the distribution of gifts and supplies to all children and unfortunate families in the community.

Safe practice chute loading. The chute gate lever, or handle, is straight and properly capped. The punching bar is long, which allows loader to keep in the clear. The floor is clean and the chute and back are in safe condition

Safe car coupling. It will be noted that the coupler is standing clear of the cars with his shoulders above the top of the cars, thus eliminating the possibility of being caught between car bumpers or flanges

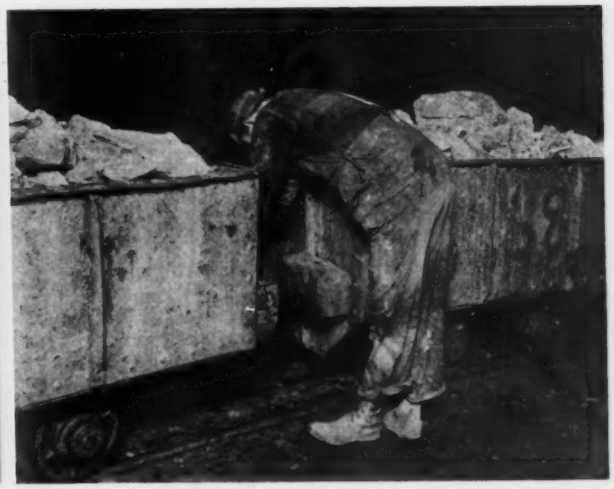
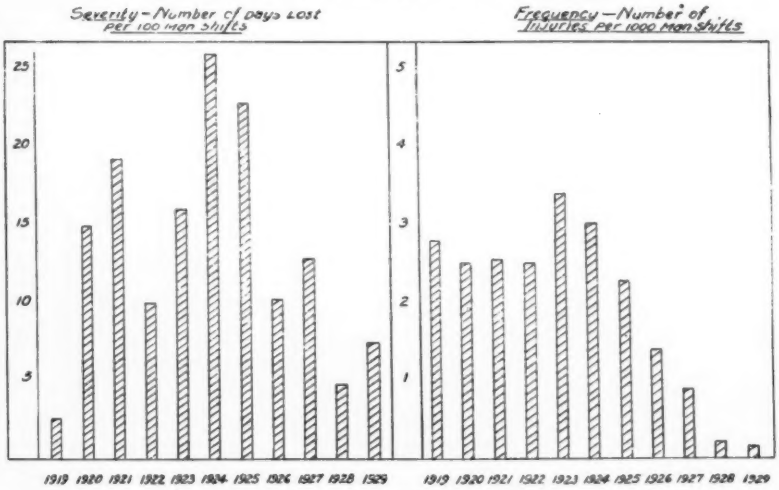


Figure 2. Severity and Frequency Comparison Chart



NOTE: 1919 for a period of six months only

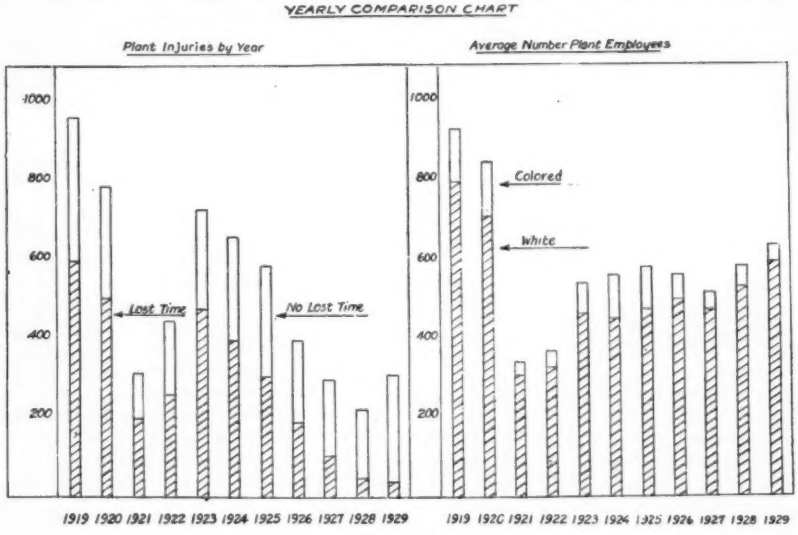


Figure 3

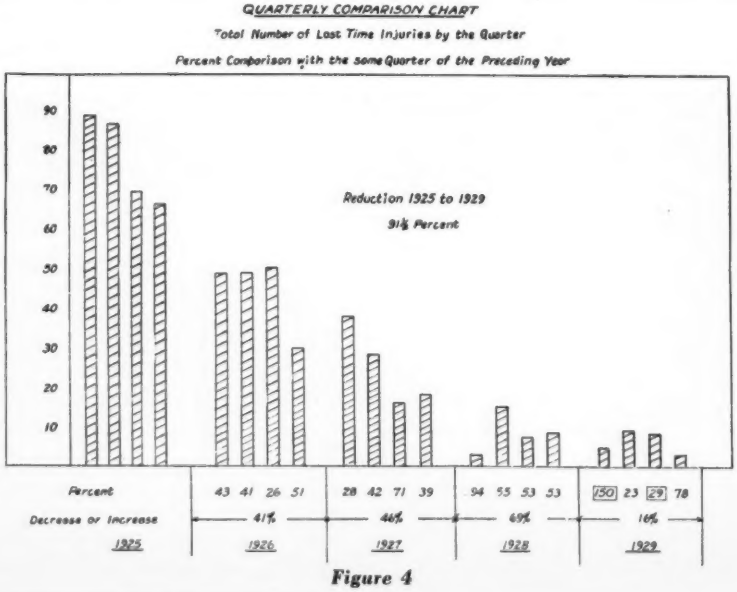


Figure 4

American Zinc, Lead and Smelting Company

Sanitation

Sanitation is most essential and Mascot has long since been given the reputation of a clean mining town and a healthful place to live. A daily disposal of garbage and refuse is maintained. Roads and walks are constantly worked and the general appearance of the town is continually being improved and beautified. All water for domestic purposes is treated by an up-to-date filtration plant and analyses are made at regular intervals by the plant chemists, as well as by the State Board of Health. A dairy herd is maintained for the purpose of furnishing milk to company employes and milk is tested regularly. All dwelling houses are screened and employes are required to keep their premises in a clean and sanitary condition at all times.

Rentals

The town of Mascot was laid out from a residential standpoint with the idea of segregating as far as practicable, the different classes of labor, one district for department heads and officials, another for foremen and clerical employes and so on, the colored section being separate from the white. Most of the houses have sufficient land for small gardens but where this is not possible, garden plots are provided on near-by tracts, as we find that most of our people like to raise their own garden produce.

The rents are comparatively low and all the dwellings are electrically lighted and the better type of houses are equipped with baths. Water for domestic purposes is piped throughout the town.

Safety and Accident Prevention

Safety stands in the front ranks along with production and cost and we feel that our employes are 100 percent sold on the idea. This does not mean that we are 100 percent perfect, but the results that have been obtained in the past few years would indicate that safety is not being neglected. The safety organization chart figure shows the methods followed and the activities necessary to keep this ever important part of the industry alive and active.

Detail statistics are kept, showing all angles of exposures, causes of accidents, results of injuries, time losses and costs.

Not only are department heads and foremen furnished with accident statistics, but the men as a whole are advised of the activities of safety and the results of injuries through the departmental bulletin boards.

Monthly bonuses are paid to foremen for good safety records, based on the man hour exposure of their crews. Every day-pay employe who goes an entire year without a lost time injury, also receives a cash bonus at the end of each year.

Safety inspections are made quarterly by the general safety committee of the entire property, and inspections by the workmen's safety committees monthly. All recommendations made by these safety committees are complied with immediately from orders issued by department heads and a follow-up system is used in checking up this work. If an impracticable suggestion is made by a safety committee, the department is required to give an explanation why the work can not be done.

Severity and frequency chart, *Figure 2*, and yearly (*Continued on page* 854)

Medical and Welfare Work at Mascot

By **H. J. Bolin, M.D.***

THE medical department of the American Zinc Company is run on a different plan from that in use in most mining camps, in that the doctor is entirely responsible to the company.

The employes do not pay the doctor but pay the company a fee as provided for health and welfare. Each married man with a family, living on company property, is required to pay $1 per month fee; married men with families not living on company property, or married men living on company property without a family, pay 50 cents per month fee; and each single man on the comany pay roll is required to pay 50 cents per month fee. The fee is applied to the promotion and maintenance of the health and general welfare of employes and their families while on company property, and to provide all medical services and drugs necessary for said purposes.

The medical department not only embraces the practice of industrial medicine and surgery but also includes preventive medicine, sanitation, and welfare.

Each employe is given a physical examination before he signs up (see Chart No. 1), and any particular disqualification noted. In case he is unfitted for the particular job he applies for, if there are any openings in other departments the director of personnel is able to place him. If a man desires to transfer from one job to another, the transfer has to come through the labor department, and if the card shows that the man is not physi-

GONORRHEA

DISEASE OF EYES AND THROAT R.20/ L.20/

DEFORMITIES

HEART BLOOD PRESSURE S. D.

PULSE

LUNGS

EVER RAISE OR SPAT BLOOD

REMARKS

FORM 70- CHART #1

AMERICAN ZINC CO. OF TENN.

PHYSICAL EXAMINATION

NAME RACE DATE

ADDRESS AGE SEX

WEIGHT HEIGHT HAIR EYES

SCAR OR MARK

MARRIED OR SINGLE NO. IN FAMILY

CONDITION OF JOINTS

ANY EVIDENCE OF FRACTURE

EVER INJURED DATE KIND

RUPTURE TRUSS

VARICOCELE OR HYDROCELE

HEMORRHOIDS

SYPHILIS OR HISTORY OF

* In charge of medical department, American Zinc Company of Tennessee.

T-70—2M—1-29 CHART #2

AMERICAN ZINC COMPANY OF TENNESSEE
MASCOT, TENNESSEE

MEDICAL RELEASE

Date.....

To Foreman:

The bearer .....
has been treated and is now able to return to work.

Accident No......

Date of Accident..... .....Dr.
Medical Department

Form 75 CHART #3

AMERICAN ZINC CO., OF TENNESSEE
MASCOT, TENNESSEE

FOREMAN'S ACCIDENT REPORT

Name Date

Place of Accident

Nature of Injury

How Injured

Remarks Witness

Send one copy to Company physician and one to Labor Department.

Foreman

cally fitted for the job, he is not permitted to transfer.

If a man is off due to illness or injury he must obtain a release from the medical department before returning to work (see Chart No. 2). If he is able to perform some duties and unable to perform the duties of his former job he is permitted to return to some lighter form of work. In this way insurance riding and malingering has been practically eliminated.

The company furnishes medical and surgical treatment for all employes and has a doctor and visiting nurse, one of which is on duty at all times, and all injuries are taken care of at once. Combined with the doctor's office, a five-room emergency hospital is maintained to take care of emergency surgical work. All serious injuries are sent immediately to the hospital in Knoxville, where first-class hospital facilities are available.

After having received first aid at any of the first-aid stations scattered throughout the plant, the injured is given a foreman's report of the accident, which is to be brought to the company doctor, and acts as an order for medical or surgical treatment as well (see Chart No. 3).

The injured is then treated by the doctor or nurse, and a doctor's report is made and sent to the labor department, where a complete file of all injuries is kept (see Chart No. 4). If the man is able to perform his duties, he is permitted to return to work; if not, he is held off until recovery.

The visiting nurse makes a daily routine visit to the sick with bedside care as ordered by the physician. She makes pre-natal visits and checks up all expectant mothers, teaching them the importance of proper diet, etc. After delivery she makes daily calls and cares for both mother and infant as long as the mother is kept in bed, and teaches some member of the family how to continue the proper care of both; she checks up on the infant's weight, and in this manner many babies are saved, as very often they do not receive proper nourishment unless augmented feedings are instituted. She makes sanitary inspections of the camp, which includes inspection of houses and premises, outhouses, chicken lots, fumigation of houses after contagious diseases, etc. She conducts classes in personal hygiene and proper care of the sick, with particular attention to diseases, which includes proper diet. She also visits the unfortunate and needy and assists the county board of health nurses in their educational work in connection with the parent-teacher association.

Since the early days the company has spent a great deal of money in installing a modern water plant and dairy. These, with other modern, sanitary methods in use, and the dispensing of serum and vaccines, has made the camp practically free from epidemics of all sorts. Especially is this (*Continued on page* 854)

CHART #4

FORM 74

Has the Injured an Insurance Policy? .....

ACCIDENT REPORT, File No. .....

IMMEDIATE REPORT OF ACCIDENT

To Employee of American Zinc Company of Tennessee

MASCOT, TENNESSEE

Injured Person

Name ..... No. ..... Address .....
Was injured about ..... o'clock ..... m., on the ..... day of ....., 192...
Age ..... Occupation ..... Department .....
If under twenty-one years of age, has he given a minor's release? .....
Nationality ..... Does he understand English? .....
Weekly wages $..... Married or single? ..... (Give number in family)
Dependent relatives? .....
General duties? .....
How many years experience in this particular work? .....
How long in service of the Company? .....
How long in this particular work? (in service of The Co.) .....
Skilled in this work? ..... Instructed as to its hazards? .....
By Whom? ..... (Give name and occupation) When? .....
Were instructions fully understood? .....
Under whose immediate direction was this work being done? ..... (Give name and occupation)
Name and address of foreman in charge of work? .....

The Injury

Nature and extent .....
Was surgical aid rendered? ..... When? .....
By Whom? ..... (Give name and address) Where? .....
What did the surgeon do? .....
Total incapacity from work for ..... (Doctor's opinion)
Partial incapacity from work for ..... (Doctor's opinion)
Where was injured finally taken? .....

The Accident

Place .....
Statement of injured person (IMPORTANT—State as nearly as possible, in injured person's own words, the cause of the injury and the manner of occurrence) .....
Above statement heard by ..... (Give name and address)
Where was statement made? ..... How soon after accident? .....
Remarks: .....

The Accident

Description of accident by eye witnesses: .....
Name and addresses of all witnesses .....
Name and addresses of all persons who know of the then condition of the machine, appliance or agency occasioning the accident .....

The Machine Appliance or Thing Immediately Causing the Accident

What was it? .....
In whose control at the time of the accident? ..... (Give name and occupation)
Was it sound and in good working order? .....
Who can prove this? ..... (Give name and occupation)
Who was responsible for its condition? ..... (Give name and occupation)
When inspected? ..... By whom? ..... (Give name and occupation)
Was there any defect in the machine or appliance? .....
Was the Company or foreman notified of defect? ..... (Give name and occupation)
When? ..... By whom? .....
Did injured person know of defect? .....
Was the light good? ..... Have broken parts been preserved? .....

Contributing Causes

Carelessness of injured person? ..... How? .....
Negligence of fellow workman? ..... Who? .....
How? .....
Violation of rules? ..... How? .....

Has injured returned to work? ..... Date .....
Date of this report ....., 192...
Remarks: .....

This report made out by
(over) ..... (Give name and occupation)

American Zinc, Lead and Smelting Company

Airplane view of Rose Lake Smelter, American Zinc Company of Illinois

Metallurgical notes on the production of these products by American Zinc Company, of Illinois, East St. Louis and Hillsboro, Ill.

Slab Zinc, Sulphuric Acid and Zinc Pigments

By **Robert Ammon** *

THE Rose Lake Smelter of the American Zinc Company of Illinois was designed for the treatment of Joplin Zinc Concentrates prior to the advent of the flotation process in that field. With the annually increasing production of Joplin flotation concentrate, a revamping became necessary, and in 1928 Herreshoff roasting followed by Dwight Lloyd sintering was adopted. At the present time the plant handles 70 percent flotation and 30 percent milled concentrate.

The installation of this equipment opened up new fields of concentrate supply such as Tennessee, Wisconsin and the Western states. Zinc concentrates from these states heretofore had been excluded from treatment at the Rose Lake plant on account their being predominatingly flotation products.

The sulphur eliminated from the concentrate is converted to 60° Baume sulphuric acid, and the zinc in the roasted ores converted into slab zinc by distillation or into zinc pigments at the Hillsboro plant.

* Chief Metallurgist, American Zinc, Lead & Smelting Co., East St. Louis, Illinois.

Handling of Concentrates

The bulk of flotation concentrate is received daily as used, unloaded direct from railroad cars and conveyed to steel feed bins on the Herreshoff roasters. The milled or coarse concentrate is dried under 1 percent moisture and crushed through ⅛-in. opening, as received, all of this concentrate going to dried ore storage bins for use in Hegeler roasters. In handling coarse concentrate equipment is provided for screening out —65 mesh fines which is diverted to the Herreshoff roasters to augment the supply of flotation concentrate when a shortage of this finer grade of zinc concentrate occurs. Always a reasonable storage of wet concentrates is maintained for emergencies.

AVERAGE ANALYSIS OF JOPLIN ORE RECEIVED IN 1929

	H_2O	Zinc	Lead	Iron	Lime	Cadmium
Flotation concentrates	10.1	58.09	1.50	1.59	.96	.35
Milled concentrates	2.7	58.95	.56	1.25	1.17	.39

Roasting and Sintering

Coarse concentrate is roasted on standard Hegeler kilns down to one-half percent sulphide sulphur. The kilns are rabbled approximately 45 minutes resulting in a fluctuation of SO_2 content in the roasted gas which ranges from 2 to 6 percent prior to and during the rabbling, an average of about 4½ percent SO_2 content.

Calcined ore is cooled by standing over night in industrial cars before being sent to the storage bins or furnace mix room.

Flotation concentrate carrying about

10 percent moisture is roasted in 12 hearth 21 ft. 6. in. steel shell diameter Herreshoff roasters down to from 3 to 4 percent total sulphur and at the rate of 50 to 55 tons per roaster day. Fuel oil to the extent of 8 to 10 gallons per ton of ore formerly was used on the roaster hearths to complete the roast. Natural gas has now been substituted for the fuel oil. Cast iron arms and rabbles are used throughout the roasters with the exception that on hearths 2, 3, 4, 5, and 6, Fahralloy rabbles are used. These rabbles have an approximate composition of 25 percent chromium, 2 percent nickel and 1¼ percent carbon.

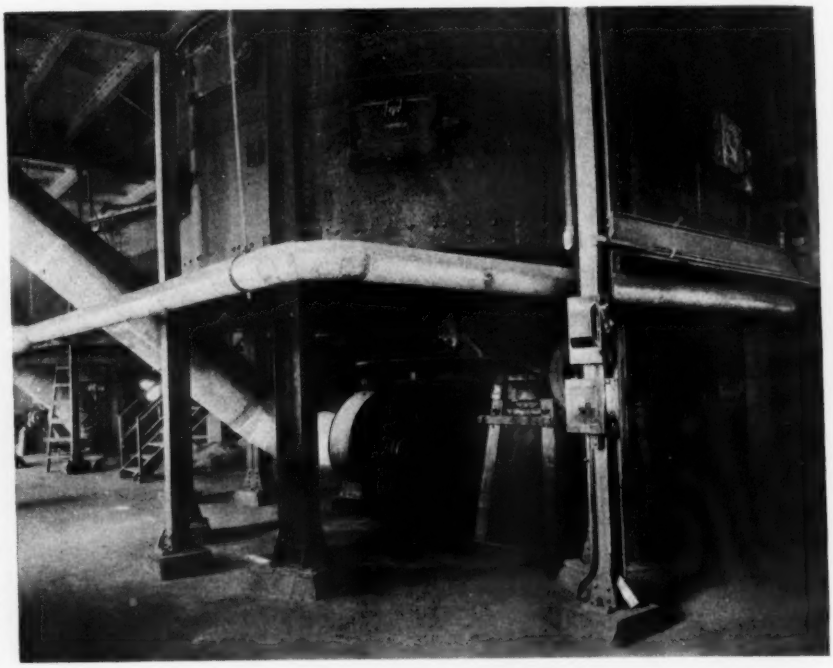
Concentrate is fed to the roaster drying hearth which eliminates approximately 6 percent of the moisture so that the feed to the first roasting hearth carries approximately 4 percent moisture. This moisture content results in the formation of what is termed "peanuts." These "peanuts" are agglomerated masses of unroasted ore varying in size up to small marbles. The calcine from the roaster is screened to remove all lumps, and these lumps are crushed and returned to the roaster feed with new ore. The screened calcine is cooled by storage in steel bins adjacent to the roasters from which it is delivered to the sintering plant by a rubber conveyor belt.

The drafting of the roasters is controlled by the speed of the acid plant fans, the practice being to hold a balanced draft on the second roasting hearth. Gases leaving the roasters carry approximately 6 percent SO_2 and are cleaned by settling through large flues followed by a Cottrell precipitator. The flues are cleaned daily, the dust cleaned out joining the calcine at the sintering plant.

The Cottrell precipitator is of the four-section Duralloy plate type construction operated entirely automatically. Each section of wires is rapped five seconds in every 120 seconds and all plates rapped four or five seconds in every 60 minutes. The precipitated dust is removed daily in cars, a portion being used in the sintering plant feed and a portion being sold for zinc, lead and cadmium values.

While the Hegeler calcine is a finished product, the Herreshoff calcine is both physically and chemically unsuited for distilling until the sulphur is reduced to under 1 percent and the fine particles are agglomerated. This step is accomplished by sintering on a Dwight Lloyd 33-ft. 3 windbox machine. A mixture of Herreshoff calcine, flue dust, Cottrell dust and petroleum coke is moistened to about 18 percent moisture and converted into a sintered product of less than 1 percent total sulphur. At the present time the machine is one-half equipped with cast iron bar grates and one-half with Fahralloy slotted grates of approximately 16 to 18 percent chromium, 1 percent nickel and under .5 percent carbon. Both of these types of grates give good operating conditions, and one or the other will be adopted finally according to the working unit cost.

Finished sinter cake is crushed and screened through ¾-in. by ½-in. ton cap and delivered to the distilling furnace mix room. Grate dressing is used to the extent of a ¾-in. layer of the screen oversize.



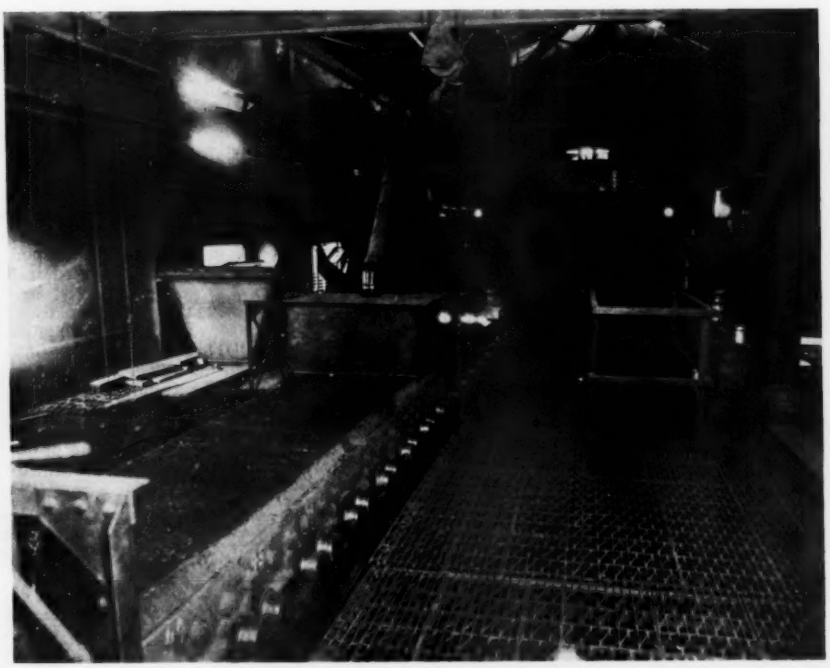
Drive Floor Herrshoff Roasters

ACID DEPARTMENT

The Hegeler and Herreshoff gases augmented in SO_2 content by brimstone burners are converted into 60° Baume acid in a modern chamber plant consisting of Glover towers, ammonia oxidation equipment, rectangular chambers, Mills-Packard chambers and Gay-Lussac tow-

ROASTER COMPARISONS

	Hegeler	Herreshoff
Daily charge	87,000 pounds	102,000 pounds
Total sulphur in calcine	1.10 percent	3-4 percent
Effective roasting area	3,150 sq. ft.	2,742 sq. ft.
Fuel per ton feed	750 pounds producer coal	8-10 gallons oil
Sulphur to acid plant	97 percent	90 percent



Dwight-Lloyd Sintering Machine

American Zinc, Lead and Smelting Company

Oxide Plant, American Zinc Company of Illinois, Hillsboro, Ill.

ers. The plant is divided into two separate systems with a combined capacity of 300 tons in 24 hours of 60° acid. One system handles the Hegeler gases and the other system treats the Herreshoff gases with a circulating acid flow common to both systems. With a practically constant tonnage of SO_2 from concentrate roasting the fluctuations in acid production are controlled by varying the amounts of brimstone burned.

The SO_2 gas is drawn through the entire roasting and acid systems by fans, which are the chief control of the volume and the velocity of the gas streams. Nitrogen oxides used in conversion of SO_2 to SO_3 are added to the Glover towers. These oxides are produced from anhydrous ammonia by means of three units of ammonia oxidation equipment, two for constant use and the third for a standby unit. With all three units in operation ammonia can be converted to the equivalent of 1,000 pounds of sodium nitrate per hour.

Water necessary for combining with the SO_3 to form H_2SO_4 is added at the lead chambers by means of Monarch sprays using 1½ to 2 millimeter openings. Water supply for all of the Rose Lake operations is derived from wells on the property. This water carries large quantities of undesirable impurities and so water used throughout the acid manufacturing is given a lime-soda treatment, which eliminates the greater percentage of objectionable impurities.

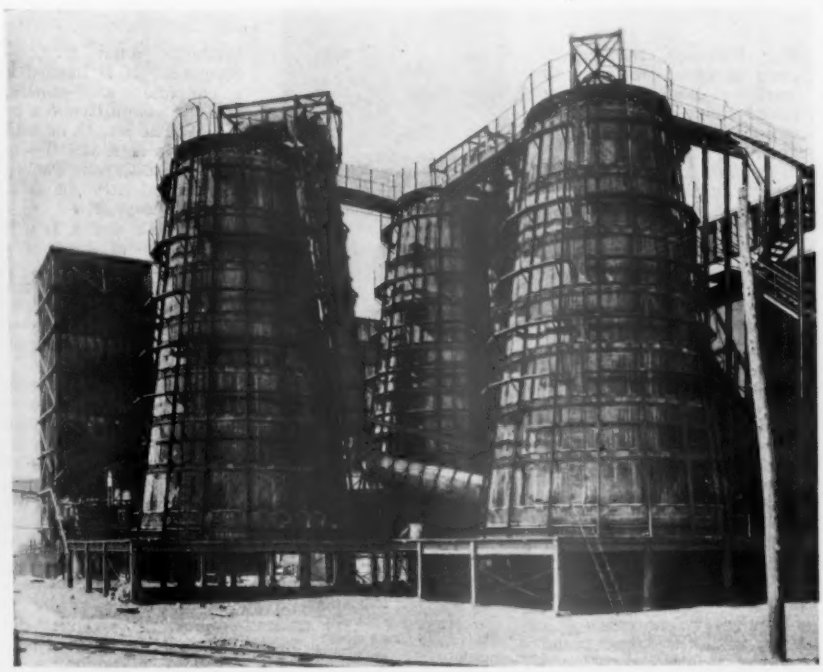
The analysis of raw and treated water is given below:

Parts per million	Raw water	Treated water
$Fe_2O_3+Al_2O_3$	42.0	Tr.
SiO_2	36.0	3.0
CaO	350.0	72.5
MgO	134.6	43.2
Cl_2	45.2	109.0
SO_3	564.0	505.0
Na+K	180.0	701.0

Normally the lead chambers are operated under a pressure slightly above atmospheric, averaging approximately .3 in. of water in the front chambers and .1 in. water in the last chamber. Acid circulation is approximately three times the make of finished acid, Lewis centrifugal pumps being used to move all circulating acids.

CHAMBER AND TOWER DATA

Unit	No. in use	Total cu. ft. space
Lead chambers	18	691,000
Mills-Packards	6	111,000
Glover towers	3	18,117
Gay-Lussacs	4	29,078



Mills-Packard acid chambers with acid plant circulating water cooling tower at the left

Zinc Distillation Furnaces

Neureuther Siemens regenerative furnaces are used throughout with both hand charging and mechanical charging equipment, the newer furnaces being equipped with mechanical chargers. For a complete description of this charging equipment see May 23, 1930, issue of Engineering and Mining Journal. A distinctive feature of the Neureuther furnace is the partial discharge of air and gas half way up the combustion chamber by means of vertical ducts with ports in the center wall. The opening of the ports is decreased when necessary by the use of small carbofrax wedges inserted from the furnace front. All furnaces are five-row 800-retort capacity except the most recently constructed unit, which has six rows and 960 retorts.

Furnaces are operated under a slight gas pressure which is controlled by stack dampers for the combustion gases, air fans for the combustion air and producer gas main pressure which is in turn regulated at the gas producers. Gas and air reversals are usually made every 15 minutes, but this may be varied when necessary. In addition, a 24-hour reversal of gas and air flow through checkers is made.

The daily cycle usually requires five hours for setting up the furnace and 19 hours for distilling. In this cycle the first operation is changing retorts, followed by the fourth and final draw of metal, then the discharging and recharging of the retorts. The furnace residues are blown out by means of water. Defective retorts found after blowing out are not changed until the next day, and usually about 1.2 percent of the total retorts are open. One retort is always left open in a center section, and the temperature of this pot is read hourly with an optical pyrometer and a careful record made of these readings. Normally this procedure indicates the trend of the firing of the furnace, but is not used solely as a control.

Charges for the hand operated blocks are made up by "machines," four to a furnace, while for the mechanically charged blocks charges are made up and charged by rows. The calcine, sinter or a portion of each is mixed with about 35 percent reduction fuel consisting of 80 percent coke and 20 percent high grade bituminous coal in the mix room each day, and stored on the furnace floor for the next day's charging. One and one-half percent to 2 percent salt, based on the weight of the calcine or sinter, is added.

Blue powder and skimmings on the mechanically charged furnaces are returned to the mix room each day for making up the blue powder rows charge in the same manner as is followed on new ore. Reduction fuels are crushed prior to mixing (*Continued on page* 849)

American Zinc, Lead and Smelting Company

First Aid Contest

PERSONNEL and SAFETY at the East St. Louis Plant of American Zinc Company of Illinois

By **N. L. Allen***

COOPERATION, of course, is constantly emphasized. The organization line-up is made quite flexible in practice. In no way is its application permitted to interfere with departmental harmony or cooperation.

Concentration of the supervisory personnel at the plant permits frequent consultation. Plant meetings, attended by the staff, plant department superintendents, and principal foremen, are held at frequent intervals. Everything from Safety to departmental operating costs are discussed. Quite frequently a decision on an important item is withheld until the question can be considered at one of these meetings.

We believe that much is gained by imparting to each department some knowledge of what is taking place in the others. Each process is so dependent on the others going before that it is advantageous for all concerned to know not only the results desired but the reasons why.

It has been the company's policy whenever possible to award additional compensation in the form of monthly bonuses for extra or meritorious results. For instance, there has been in effect at times a variable bonus schedule based on zinc furnace recoveries. All men in the smelting department share in the bonus when furnace results indicate that it has been earned.

Safety First

Organization

Work in a retort zinc smelter is more hazardous than in an average industrial plant. Furnace men work at high speed under terrific heat conditions. Besides molten metal, much hand handling of red-hot materials is necessary. Burns are, therefore, the chief source of injuries in this department.

Sulphuric acid in another department presents a serious hazard to be guarded against. Around a plant of this description there is an abnormal amount of dust particles which so easily find their way into one's eyes.

Our safety campaign dates from May, 1928, with the appointment of the first general safety committee. The general safety committees are chosen by the plant manager from the plant superintendents and principal foremen. It is headed by a chairman and consists of four committeemen besides. The length of service is two months. Therefore, six different general committees are in office during the year.

Herewith are a few of the duties of a general safety committee:

Inspect the plant and report with written recommendations for removal of hazards and improper working conditions.

Investigate fully every injury, whether lost-time or no-lost-time.

If it is a lost-time injury, the entire committee meets at the place where the injury occurred and renders a written report.

If possible, the responsibility for the injury is determined and recommendations are made as to how a repetition may be avoided.

Institute new and novel means of selling safety to the rank and file.

Arrange and conduct program for the regular monthly safety get-together. This meeting includes all department heads and foremen.

A fine spirit of healthy rivalry has

* Plant manager, American Zinc Co. of Illinois, East St. Louis, Ill.

The General Safety Committee starting on an inspection tour

been built up between these general committees to try and best the safety record of those going before. Consequently, they are on the alert and are most efficient. Care is always taken in picking the chairman.

The competitive spirit has been taken advantage of wherever and whenever possible. There is a large board at the plant gate showing the number of "lost-time injuries," "today," "this month" and "this year," by departments. If a department suffers a lost-time injury, a red light burns for this department for 24 hours. A green light indicates a clear record. Some departments have seen fit to use the sign idea to boast of their safety record. For instance, over the Pottery entrance there is a large sign which reads "No Lost-Time Injury in 19 Months. Beat That."

Department heads appoint workmen to serve as safety inspectors in his own department. He is identified by wearing a large safety button and he serves for a period of from two weeks to a month. His duty is to be on the watch for, and to caution, men engaged in any unsafe practices.

Many valuable safety suggestions and ideas have come from the men in the ranks. Each is given prompt consideration. If impractical, the man is told so with all the reasons; if adopted, full credit is given.

First Aid

All department heads and foremen and about 20 percent of the men have completed a course in first-aid training given at the plant under the direction of state and Government experts. Men are paid their time while engaged in first-aid practice or instruction.

Twice, five first-aid teams have met in competition. One of these teams represented the zinc company at the international contest in Kansas City last year.

All first-aid work is in charge of a separate committee which, unlike the other committees, changes personnel only once a year.

First-aid boxes have been established in every department and fitted out to suit its own particular needs. Besides there is an emergency room and supply equipment at the gate house.

Beginning with May, 1928, and to the present time, the lost-time injury curve has steadily declined. The total number of lost-time injuries sustained during the year 1929 when compared with that of 1928 shows a reduction of 57 percent. Comparing the first four months of 1930 with the same months of 1929 gives a further reduction in lost-time injuries of 44 percent.

We use various kinds of printed matter on the departmental bulletin boards, but our experience has been that "home-made" posters are of greater interest and effectiveness. Photographs are taken showing the "right" and "wrong" way of doing things. In making these we try to get as many different employes into the pictures as possible. It has developed that one of the department heads is a clever cartoonist. He makes illustrated posters under the nom de plume of "Spelter Sam." These attract wide attention.

After all is said and done, carelessness (and by this we mean failure to take the proper precautions) is the cause of most injuries. The aim has been to make everyone "safety-minded." Believing that certain ideas had to be sold, we have tried to be modern by using high-pressure methods and by advertising.

SLAB ZINC, SULPHURIC ACID, Etc.

(*from page 847*)

so that the mixed charge ready for the retorts has the following screen analysis:

Screen size	Percent total solids
+3 mesh	7.0
+6 mesh	20.0
+10 mesh	18.0
+20 mesh	18.0
+35 mesh	15.0
—35 mesh	22.0

Due to the fact that the calcined zinc concentrate and sinter varies in zinc tenor from 66 percent to 71 percent, all furnace charges are calculated to give a definite weight of zinc for each charge, varying the weight of ore according to its assay. In this manner the furnaces contain exactly the same amount of zinc each day which equalizes some of the firing difficulties for the best reduction. All materials entering the furnace charges are actually weighed carefully.

Producer gas for firing the blocks is furnished by a modern design of Morgan gas producers using a low ash coal. The temperature of producer gas leaving the producers is held at 1,200° F. maximum in order to reduce the amount of carbon carried over into the furnaces as soot, which tends to choke the comparatively small gas ports. The gas carries an average of 26 percent CO with 148 net B. t. u.s per cubic foot. Periodic cleaning of the gas main and careful regulation of the producer gas temperature reduces the sooting troubles to a negligible quantity.

The residues from the distilled charge are weighed and assayed daily, a careful check being kept upon the amount of unreduced zinc. The residues are then treated in a small concentrating mill where considerable unconsumed coke is recovered for reuse in the furnace charge. A zinc concentrate carrying 45 percent zinc and 5 percent sulphur is also recovered from the residues, and this product is added direct to blue powder or upper rows of two blocks of retorts without preliminary roasting.

Condensers last about seven days and when discarded are concentrated in the gravity mill to a 70 percent zinc concentrate. This concentrate is likewise recharged into the blue powder sections of all furnaces. The residues and condensers are concentrated separately, with the mill operating six days a week on residues and the seventh day on condensers.

Six different lengths of retorts are used, varying from 51 to 65 in. inside length with 1½-in. butts and 1-in walls. All are 8⅝ in. inside diameter after burning, the average life being 37 days. The retorts used are known as a high silica retort carrying 69 percent SiO_2 and 20 percent Al_2O_3, and are made from a patented mix using silica flour. The raw materials and retorts in process of manufacture are all handled in a carefully controlled manner. Each day, finished retorts from the pottery drying rooms are charged into gas fired kilns on the furnace floor where they are brought up to 1,700° F. in 10 hours with a uniform temperature increase. In handling the burned retorts from the kiln to the furnaces every precaution is taken to prevent them from being chilled and to handle them as quickly as possible. Sudden though comparatively slight variations in temperature cause checks which are fatal to the life of the retort. A complete record of every retort placed in the furnaces is kept so that exact data are available by single retorts, rows, sections, furnaces or blocks.

The condensed zinc is drawn from the furnaces four times in the operating cycle and cast into slabs which are either shipped direct or sent to a remelting furnace for equalizing.

Zinc Pigment Production

At Hillsboro, Ill., 70 miles east of St. Louis, the American Zinc Company of Illinois operates a plant for the production of lead free and leaded zinc oxides.

Mascot roasted lead free ores and Joplin roasted ores are converted into oxides on Wetherill grate furnaces, according to usual practices. The mixed charge of ores and fuels is stored in bins on the furnace floor. Each block consists of 12 sets of grates, one of which is charged every hour. The charge is placed on the grates by mechanical chargers, but the clinkers are removed by hand.

The zinc oxide is drawn through long cooling trails and collected in a baghouse using woolen flumes.

The entire arrangement is flexible, allowing the production of various types of oxides at will.

Leaded oxides are packed for shipping direct from the baghouse, but all lead free oxides are refined by a patented process before shipping.

American Zinc, Lead and Smelting Company

The American
in the

THE Tri-State District is generally understood to include Lawrence, Jasper and Newton Counties in southwest Missouri, Ottawa County in the northeast corner of Oklahoma, and Cherokee County in the southeast corner of Kansas. Comparatively large sections of this general area have proven to be richly mineralized with zinc and lead sulphides, silicate and some lead carbonates.

It is reported the first ore discovery was made near Joplin, Jasper County, Missouri, in the early fifties, but mining operations were confined to the very shallow ores for many years thereafter and the production, of lead only, was of little consequence. Subsequently, the Granby and Aurora Fields in Newton and Lawrence Counties and the Webb City-Carterville Field in Jasper County were developed, the latter including Oronogo, Duenweg and many smaller outlying camps. Just prior to the World War, an ore discovery was made in Ottawa County, Oklahoma, and from this the very richly mineralized Picher Field was rapidly developed, which soon extended north into the southern part of Cherokee County, Kansas. Increased operating costs during the war finally prohibited the profitable operation of the lower grade mines in southwest Missouri, and for the past twelve years the Oklahoma-Kansas Fields have accounted for much of the larger percentage of the District's production.

The American Zinc, Lead & Smelting Company has owned mineral lands and lease rights in the Tri-State District since its organization and incorporation during the year 1899. Throughout this 30-year period it has been a substantial producer of zinc and lead concentrates and a lessor of large acreages for mining purposes, also a purchaser of zinc concentrates for its smelters, originally located at Caney and Dearing, Kans., but later for shipment to its newer plants at East St. Louis and Hillsboro, Ill.

The well-known American Davey Mines at Carterville were operated from about 1902 until 1919, being located in what is known as the "sheet ground area." This group of four properties produced approximately 7,500,000 tons of ore, averaging 1.72 percent zinc blende and 0.73 percent galena, from a cut area amounting to 130 acres. During this same period the Hochaday Mine at Oronogo and the Vogey Mine at Porto Rico were in operation, producing about the same character and grade of ore. During the year 1916, the American Zinc Company purchased the entire holdings of the Granby Mining and Smelting Company, including, within the Tri-State District, the fee title to large acreages of land in Jasper and Newton Counties, Mo., on which numerous lessees were mining; a lead smelter and custom concentrating plant at Granby; and two company-operated mines, the Klondike at Granby and the B. & H. at Joplin. These Granby company properties were continuously in operation with a substantial production for a period of about three years, but since 1919 general operating and market conditions have governed the output, which has been intermittent and very much reduced. In 1921 an optional operating agreement was entered into with the High Five Mining Company, covering its fee and leased lands in the Waco Field, north of Joplin, and by March 1, 1922, a profitable tonnage of high-grade, lead-free zinc ore was developed and put into production. This property was operated over a period of five years with an output amounting to approximately 450,000 tons of ore, yielding 5.70 percent ZnS., the concentrate containing 61.50 percent Zn. Some further prospecting and development work on this and adjoining tracts was undertaken by the American Company and later carried on by the St. Louis Smelting and Refining Company, the latter exercising its option to purchase all the Waco property and mining rights of both the American and High Five Companies early this year. Some prospecting was also done on a few widely scattered leases in the Picher Field, but no commercial ore discoveries were made. During the year 1924, however, a subsidiary company, the American Zinc Company of Oklahoma, was organized and through it a lease of 20 acres of the Douthat land, south of Cardin, Okla., was purchased. Sufficient ore to justify the erection of a concentrating plant was soon developed and on January 1, 1925, the property started producing both zinc and lead concentrates. Early in July, 1926, the subsidiary company purchased another lease on 40 acres of land fully equipped and in operation within the limits of the city of Picher, this being known as the Big Chief Mine. These two last mentioned properties have been operated almost continuously since acquisition.

At present the activities of the American Zinc Companies in the Tri-State District involve the sale and leasing of real estate for both mining and agricultural purposes, the search for, development and production of zinc and lead ores, and the purchasing of zinc concentrates. All this business is handled through a central office located in the McKinley Building, at Joplin, Mo.

The fee lands of the company include some acreage of little or no mineral value, but much of which is productive of fruits, vegetables, grain and cattle. All tenants operate under a form of farming license that reserves prospecting and/or mining rights to the company, with a definite provision for the retaking of possession upon reasonable notice properly served on the licensee. A similar license is used for the renting of city lots and dwellings in Granby, Carterville and Oronogo, where such holdings are extensive. The nominal cash rental charges are payable annually in advance, but under existing conditions considerable time and effort must be expended on making collections. For several years prior to the depression of the farming industry these agricultural lands were being sold quite freely at reasonable cash prices, but during the past three years only a limited acreage could be disposed of.

The mineral lands, when worked for shallow ores by individuals and small mining companies, are covered by license contracts only, and when a large operation is contemplated a lease is granted. The ore is mined and the concentrates recovered and sold by the licensee or lessee, all settlements being made in the name of the lessor, who, upon receipt of each settlement, promptly deducts the

Below, shoveling and drilling in a high stope

* Manager, American Zinc, Lead & Smelting Co., Joplin, Mo.

Zinc, Lead and Smelting Company
TRI-STATE DISTRICT

By **G. W. Johnson ***

royalty then due. The royalty charges vary, depending on the character of ore mined, the extent of operations, and quite often the grade of ore and markets, the rates ranging from 7½ percent to 15 percent of the gross value of the concentrates produced and sold. The miner of the shallow ores usually prospects by shaft and drifts, using a windlass, horse hoister (hoss hister), or possibly a steam outfit and, if an ore discovery is made, hand jigs are installed or the ore is conveyed by wagon or truck to a nearby custom mill for "cleaning." The larger companies generally prospect for the deeper ores with churn drills and as nearly as possible determine the grade and extent of the ore bodies discovered before developing and equipping for mining and milling operations. Approximately 6,750 acres of the company's lands are now held under lease by others for mining purposes.

For more than a year now extensive exploration and prospecting operations have been carried on by the company in some of the outlying areas of the District, where more or less mineralization is known or the geological conditions are favorable. Leases have been secured on large acreages in the vicinity of the Crestline and Lawton Fields in Cherokee County, Kans., and the Waco-Asbury and Carthage-Alba-Neck City Fields in Jasper County, Mo. These areas are structurally mapped in so far as possible from surface observations and the most attractive sections further studied and prospected with churn drills. Some work has been done in the Picher, Okla., Field also, but mostly for the extension of ore bodies previously discovered by others.

A sincere effort is made at all times to provide safe working conditions for company employes. The superintendent and foremen give this problem much thought and attention and, with the cooperation of their men, very gratifying results have been obtained. The following comparative statement covering operations for the past three years clearly indicates the value of this work:

Accidents Per 1,000 Shifts	
1927	2.45
1928	1.96
1929	2.14

Lost Time Accidents Per 1,000 Shifts	
1927	1.29
1928	0.64
1929	0.76

All employes are given a physical examination at the Picher clinic at least twice each year and, if deficiencies are found, assistance is rendered in so far as possible for their correction. Close cooperation is also maintained with district mine inspectors and the Welfare and Safety Departments of the Tri-State Zinc and Lead Ore Producers Association.

Operating costs vary considerably over the district due to the different physical conditions of the many properties, some difference in the mining and milling practices, plant capacities, and quite often to the accounting methods employed. Figures compiled from the records of a large number of operating companies during the year 1929 indicate the total operating cost per ton of ore mined for that period was $1.78 with a concentrate cost of $28.53 per ton. Including royalty payments, depletion and depreciation, the total cost of a ton of concentrates was approximately $40. Since the first of the new year, however, operating costs have been substantially reduced, probably in excess of 20 percent.

Big Chief Concentrating Plant at Picher, Okla., operated by American Zinc Company of Oklahoma

Lead smelter of the American Zinc, Lead and Smelting Company at Granby, Mo.

The American Zinc, Lead & Smelting Company is in the market each week for a substantial tonnage of zinc concentrates and through its Joplin office handles between fifty and sixty thousand tons annually. The purchase, usually made on Friday, is loaded by contract and shipped (*Continued on page* 854)

American Zinc Oxide Company

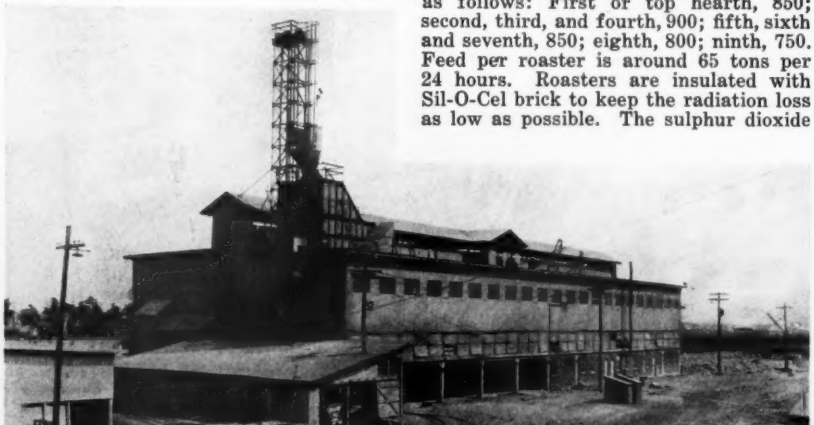
Columbus, Ohio

By **J. I. Wall** *

AMERICAN Zinc Oxide Company, a subsidiary of the American Zinc, Lead & Smelting Company, owns and operates an oxide plant at Columbus, Ohio, manufacturing AZO "ZZZ" lead-free zinc oxide.

Selected high-grade lead-free zinc concentrates received from the American Zinc Company of Tennessee, Mascot, Tenn., another subsidiary of the American Zinc, Lead & Smelting Company, are unloaded from box cars by means of mechanical conveyors direct to feed bins over Wedge roasting furnaces.

These roasting furnaces are equipped with the "ORD" patented bypasses. All ore enters through the feed in the arch over the first or top hearth and, after being rabbled across the hearth, one-third of it goes direct to the second hearth, one-third bypasses through slots in the brickwork to the fourth hearth, and the remaining one-third bypasses in the same manner to the sixth hearth, thus giving practically green preheated ore to the fourth and sixth hearths to assist in maintaining uniform roasting temperatures through the roaster.

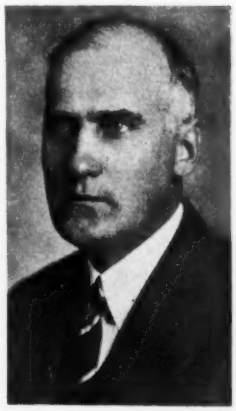


Above, Section Furnace Department. Right, Section Bag House, Refining, Packing and Shipping Departments

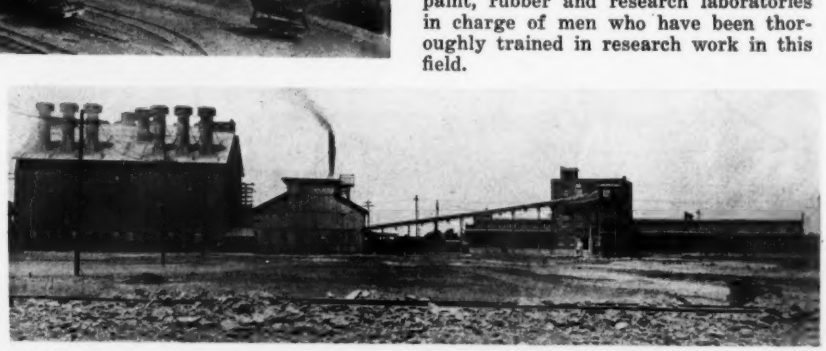
Air for oxidizing is blown through pipes in central shaft of roaster, from where it is distributed to what we call "open-end arms" (arms having 16 1-in. holes, eight on each side), after it has passed through either one or two closed-end arms to cool the arms and preheat the air. We have operated with one open-end arm on the third hearth, one on the fifth, two on the seventh, one on the eighth, and one on the ninth hearth. We have also operated with one open-end arm on all hearths except the first or top one.

The bypasses and preheated air make it possible to roast flotation or fine zinc ore without the use of fuel, and get sulphurs as low as 1 percent fault. When no fuel is used, practically all of the sulphur has been eliminated when the seventh hearth is reached, and the eighth and ninth hearths are of no use except to cool the ore, and while they preheat some air, it is probably harder to hold a roasting temperature with low sulphurs on the seventh hearth than it would be without these two hearths. In using 30 to 40 percent milled ore in the feed, the best results can be obtained with around 250 to 300 cu. ft. of natural gas per ton of feed burned in the seventh and ninth hearths, and the combustion gases from this amount are not noticeable at the chamber acid plant.

Typical temperatures on the different hearths, in degrees Centigrade, are about as follows: First or top hearth, 850; second, third, and fourth, 900; fifth, sixth and seventh, 850; eighth, 800; ninth, 750. Feed per roaster is around 65 tons per 24 hours. Roasters are insulated with Sil-O-Cel brick to keep the radiation loss as low as possible. The sulphur dioxide from these roasting furnaces, after passing through Cottrell precipitator for removal of any fine ore dust, goes to acid plant where 60° Be sulphuric acid is made. The calcine or roasted zinc concentrates discharge from bottom of roasting furnaces into industrial cars and are wetted to a desirable moisture content and then conveyed to mix room, where it is mixed with the proper amount of anthracite screenings, etc. The mixed furnace charge is elevated by means of a skip hoist bucket into overhead charge bins, where charge is drawn off by gravity into a charging machine, which travels back and forth in front of blocks of furnaces, charging them on a regular schedule. The furnaces are equipped with Wetherill grates and residues are discharged through furnace door into cars. The oxide and gaseous products are drawn through large cooling trails to bag house, where gaseous products filter through bags and oxide being retained in them. The oxide from bag house is conveyed mechanically to special furnaces, where oxide is further purified and refined, by a special patented process. The refined oxide is conveyed to screening and bolting department and then packed in rope paper bags containing 50 lbs. each, and in barrels containing 300 lbs. each for the domestic trade. Most of export trade requires 110 lb. kegs and 220½ and 224 lb. barrels.



The raw materials and finished oxide are carefully sampled and tested daily by modern and well-equipped chemical, paint, rubber and research laboratories in charge of men who have been thoroughly trained in research work in this field.



* Manager, American Zinc Oxide Company, Columbus, Ohio.

SALES and DISTRIBUTION of ZINC products

By **Thornton Emmons** *

THE sales and distribution of zinc products as in most other commodities, has changed in method materially during the last 15 years. This situation has been brought about through three main factors; firstly, through the demands of the different trades and the desire of the zinc producer to cooperate with that trade; secondly, the greater technical supervision and study that both consumers and producers of zinc products have developed, and thirdly, competition.

The general outcome has resulted in a more uniform and improved product, a better understanding of each other's problems, more efficient service, and a higher sales cost.

Looking at this situation one hears many arguments both pro and con as to whether or not this phase of development has benefited the zinc industry—particularly as to the higher sales cost. One can readily remember the time when for instance in selling slab zinc, one sold mostly by telephone or telegram, and except in particular circumstances, there was only an occasional personal contact between buyer and seller, and from my observations, right or wrong, little if any mutual understanding or real cooperation. It was practically all a case of dollars and cents. For that matter it is still a case of dollars and cents, but at least there is something also in having a closer personal contact with the man with whom you are discussing dollars and cents, and having a much closer understanding of each other's problems. Naturally, competition has had much to do in bringing this about, and that one word *competition* is usually synonymous with higher *sales costs.* By the same token, *fair competition* is a great urge in the improvement of conditions in any industry.

In attempting to write on the sales and distribution problem, it is rather difficult to know just where to stop, and at best it can only be covered in a very general way; so if any of my "Brothers in Arms" should happen upon this article, let them "hold their peace" if they do not agree with my main theme, remembering that sometime the writer will be glad to reciprocate.

Zinc products may, I think, be classified under three general headings: (1) slab zinc, (2) pigments and (3) "by-products" and zinc salts. The sales problem in distributing these three general groups is somewhat similar in each group, as in practically every other sales problem in the world; the individual approach and method or the actual problems may differ, but when boiled down, selling is selling and it would be futile to discuss ways and means.

The distribution of and industries into which these three general groups enter, are, however in many cases, totally different, and a short resumé of each group will follow in order to give as concise a picture as possible.

Group (1) SLAB ZINC.

The total world's production of slab zinc during the year 1929 was estimated by the American Bureau of Metal Statistics to be approximately 1,611,610 tons of 2,000 pounds, of which 671,868 tons were produced in the United States. Of the amount of slab zinc consumed in the United States it is estimated roughly that 47 percent is consumed in the galvanizing industry; 29 percent in the manufacture of brass, and 24 percent in sheet zinc, die casting, zinc oxide (French process) and for miscellaneous uses.

Thousands of tons of slab zinc are consumed by the steel and wire industry yearly to form a protective coating on sheets, pipes, wire, nails and miscellaneous items. This practice is commonly known as galvanizing or zincing.

Equally important is the use of zinc in combination with copper by the brass manufacturers in producing that all-important alloy called brass.

Not far behind these two comes the use of metallic zinc for sheets, strips, die-castings, and French process zinc oxide.

The market for slab zinc is usually an active one and the price varies often from day to day based on three economic essentials, the raw ore market, the stocks of metal on hand, and the demand for the metal itself.

The slab zinc industry, like most others has its ups and downs, always accompanied by cheerful or pessimistic excitement. One can understand the optimism or pessimism, but why the excitement? This condition has happened so often in the past (and probably will in the future), that one would think that the producers would have learned certain lessons, which would be instructive, or at least unpleasant enough to bring home the lesson of properly regulating their production schedules so that there would be more 'feast" and not quite so much "famine." Speaking of brass, it is an extraordinary thing that two tremendous basic metals, such as zinc and copper, should have been sitting in the same boat, quite still and serenely, knowing that they were about to be tipped over and given a good ducking, and yet making no real constructive move to avoid it. Possibly after so much experience in the past, they felt that even if they did get wet, they could swim out and dry right off. They did—they have—and they will again—possibly ambiguous but true.

Group (2).

Considering the common uses of zinc pigments such as zinc oxide and lithopone, the general public is seemingly extraordinarily ignorant as to such pigments, though strange to say the average person sometime during each day of his life, from the time that person is a "babe in arms," and covered with baby powder or zinc ointment, until he or she is being wheeled to the grave on rubber tires, is more or less surrounded by, and using articles in which zinc oxide is a very important factor.

Probably the two most important uses for zinc oxide are in the rubber and paint manufacturing industries—following these come the floor covering and textile, ceramic, enamelware, match, pharmaceutical and many other miscellaneous industries.†

During 1929 there were marketed approximately 187,760 tons‡ of 2,000 pounds, of zinc oxide of all grades; of this amount it is estimated roughly that the rubber manufacturing industry consumed 50 percent, the paint industry (including floor covering and textile) approximately 45 percent and the ceramic and miscellaneous trades approximately 5 percent.

There are three general types of zinc oxides manufactured, two of these are produced by the so-called American process or directly from ores, and the third the indirect or French process oxide is produced from zinc metal itself. The

* Vice president, in charge of sales, American Zinc, Lead & Smelting Co., Columbus, Ohio.

† For further reference as to classified lists of consumers for all zinc products, I would refer to the Zinc Tree, as published in another article on page 818 of this issue.

‡ U. S. Department of Commerce figures.

first in importance is the so-called lead free zinc oxide (American and French); the second may be termed leaded zinc oxide, and contains anywhere from 5 to 35 percent lead as sulphate. There was marketed during 1929 a total of 160,611 tons of the lead free type and 27,149 tons of the second or leaded type.

Another very important zinc pigment which has made tremendous strides forward in recent years is lithopone. This pigment, which is composed of 30 percent zinc sulphide and 70 percent barium sulphate, is used often in conjunction with zinc oxide, but here, far the greater percentage is consumed by the paint, varnish and lacquer manufacturing industries. Of the 206,315 tons of lithopone marketed during 1929, a total of 150,804 tons was consumed by the paint, varnish and lacquer trades, and the balance by floor covering and textile, rubber and miscellaneous trades.*

It is easy to see that in selling and distributing these two important products, one enters a totally different field from that which is covered by slab zinc. Because of the highly technical nature of most of the formulae into which these pigments enter, and the individual characteristics of different makes of zinc oxides and lithopones, particularly as to their relationship in compounds, vehicles, and other factory practices; it necessarily follows that the sales work connected with such distribution is of a much more highly technical nature, than in the case of slab zinc, which, regardless of who the producer is, corresponds more or less to set A. S. T. M. specifications, as to grades.

Group (3).

Speaking in general terms, all zinc companies have their different by-products which are gained, directly or indirectly, both from the ore and other departments of production. With some there may be zinc chloride, zinc sulphate, zinc dust, or as in the case of our own company, sulphuric acid, limestone fertilizer, asphalt filler, ballast for railroads or road building.

The distribution and sales of such products may be local to the geographic zone of production or national in their scope, depending on circumstances. Again such products enter many varied fields, from wood preserving in the case of zinc chloride, to dyes, cyaniding, etc., in the case of zinc dust, or fertilizing and road building when speaking of limestone.

A very important by-product produced from the roasting of zinc ore is sulphuric acid. One may call it a by-product, though in reality in the case of certain zinc producers, it is almost as much of a main product as metal itself, for the tonnage involved is very large.

Sulphuric acid has for its largest outlet tonnage-wise the iron and steel, and fertilizer industries. In addition, of course, there is the general chemical trade, petroleum and textile industries, which consume important quantities. Markets are influenced considerably by freight rates, much more so than in probably any other zinc commodities.

One can gather from this necessarily brief resumé, of one of the world's largest basic industries, that the sale and distribution of zinc products enter into so many varied fields, and under such widely diversified conditions, that the possibilities of future developments and uses are forever enticing and urging the zinc industry forward, with, one can imagine, the same feeling which imbues the explorer or prospector to go on and see what may be "on the other side of the next range."

* U. S. Department of Commerce figures.

Jarnagin Mine No. 1, American Zinc Co. of Tennessee, Jefferson County, Tenn.

PERSONNEL, SAFETY AND ACCIDENT PREVENTION
(*From page* 842)

comparison chart *Figure 3*, also quarterly comparison chart, *Figure 4*, are self explanatory and show the results of organized safety work in Mascot. We wish particularly to call attention to the 91½ percent reduction in lost time accidents from 1925 to 1929.

The company maintains an emergency hospital with a full time company doctor and visiting nurse. All departments are equipped with first aid cabinets available for minor dressings, which are administered by trained first aid men.

This property operates under the Tennessee Workmen's Compensation Law and are self insurers. All costs of safety bonuses, foremen's safety dinners and safety meetings are charged to our compensation expense and even with this, a substantial reserve, or saving, has been accumulated over and above what we would be required to pay to an insurance company, were they carrying our risk.

Each employe is required to carry accident insurance under a group policy, the premium being $1 per month. This insurance covers the employe for occupational injury for one week, which is the compensation waiting period, at half pay (specific losses and dismemberments in addition), and for non-occupational injuries for the disability period not to exceed 52 weeks. In addition to the accidental coverage, the policy also pays $500 for death from any cause, whether sickness or accidental.

MEDICAL and WELFARE WORK
(*From page* 844)

true of smallpox and typhoid fever, as well as diphtheria and scarlet fever. Through company insistence, and the aid of education by the visiting nurse, most of the citizens of Mascot are inoculated and vaccinated against diseases for which serums have been found.

A clinic is held each day by the company doctor from 10.30 a. m. to 12.30 p. m. and from 3.30 p. m. to 5.30 p. m., except on Sundays, when the hour is from 11.30 a. m. to 12.30 p. m. During these hours any employe, from department heads down, may come in for a complete physical examination and check up from a health standpoint. A great many of the employes avail themselves of this service, and in this manner many defects are discovered and corrected and proper advice given for the improvement of health. Also very often serious accidents are prevented, due to the fact that if a man is found unable to perform his duties he is held off until physically fit, or given lighter work that he can perform without any possible chance of injury to himself or others. These hours are rigidly kept, so that in case of an injury the foremen are able to get in instant touch with the doctor. The company doctor, of course, is available for calls at all hours. Before and after office hours are devoted to making house calls.

The company doctor also acts as a public health officer in conjunction with the county health authorities, inspecting meat markets, water plant, and dairy.

It is unusual for a mining camp to have the hearty cooperation of the management and employes that this community enjoys. Any improvement that is brought to the attention of the management for the betterment of health and living conditions in the camp is promptly provided by the company.

AMER. ZINC, LEAD and SMELTING CO.
(*From page* 851)

the following week. Each car or, if concentrates of two or more grades are placed in the same car, each lot is carefully sampled by representatives of both the buyer and seller, and each takes a portion for analysis by different chemists. A third portion is held for umpire in case the assays so run do not check within seven-tenths of 1 percent. All samples of flotation concentrates are assayed for zinc, iron, lead, lime and moisture, but the coarse jig and table concentrates are usually run for zinc, iron and moisture only. In making settlement a premium of $1 per unit of zinc above 60 percent is added to the base price and a like amount for each unit below 60 percent is deducted; also penalties at the rate of $1 per unit are charged for iron in excess of 1 percent, lead in excess of 2 percent, and for lime over 1 percent the penalty is $1.50 per unit. If the respective assays of the buyer and seller check within seven-tenths of 1 percent, settlement is promptly made on the average of the two; otherwise, the umpire sample is submitted for analysis and then the assay nearest the umpire or the umpire assay is used.

With but slight modifications, this system of purchasing zinc concentrates has been in force and effect for many years past.

The TRAFFIC DEPARTMENT
as an important factor of the zinc industry

By **H. S. Snow***

IT IS only within the past 15 years that a traffic department has been considered as a necessary adjunct to the operation of the average zinc smelter.

Prior to that time only a few companies had traffic departments of any moment, and rates and adjustments were generally handled through clerks and by them with the freight departments of the different railroads, leaving the matter of the correct rate to apply wholly up to the railroad clerk who was consulted. Therefore, there was no way of knowing as to whether the information received was correct.

Today practically all companies engaged in the production of zinc, more especially the smelters, have a well equipped and efficient traffic department.

A traffic department to properly function should be in charge of a man who is thoroughly familiar with the operations of all departments, so that he can intelligently represent his company before rate committees and executives.

The method of rate making of today is such that it can only be handled by a man who is not only acquainted with the rate making structure, but also with conditions that exist, and who can show by logical argument and presentation of figures the situation that is working to the detriment of the interest he represents.

All freight rates must now go before committees appointed by the carriers to go thoroughly into the proposition as to whether a rate is too high or too low, or should be changed to meet certain conditions. Consequently, it rests with the traffic department to make a strong presentation in order to get a favorable vote from these committees for the reason that, generally speaking, they are the last word as far as the making of rates is concerned.

The functions of the present day traffic department have grown until it enters into every activity of the industry.

The ability of a traffic department to secure prompt movements of all commodities permits the carrying of much smaller stocks of supplies and raw materials than was the case some years ago, thereby saving a large sum of money through the reduction of stocks and the consequent reduction of capital involved.

The efficient traffic department discovers and corrects overcharges and improper rates and classifications, as a result saving a large amount, some of which might later be recovered by the presentation of claims, and some never. By revising freight bills and having the proper rate applied before the payment of same a large amount of money is preserved that would of necessity have to be recovered by the presentation of claims at a later date. It is easy to see that instead of having claims of $50,000 or $60,000 per year for overcharges, etc., if that amount were cut to probably $5,000 per year the consequent saving is considerable.

The Supreme Court of the United States in a decision gives the shipper no recourse if he is quoted a wrong rate by the carrier, their position being that the legal rate is the only rate that can apply. Therefore, if in making a contract a lower rate is quoted than actually applies, it means a considerable loss to the seller, who has no recourse as to the carrier. It might also work to the advantage of a competitor; for example, an error of 50 cents per cwt. in the proper rate might lose a large contract which would have been secured had the correct rate been quoted.

The traffic department, for this reason, is a very necessary adjunct to the sales department, and by quoting legal and proper rates is in a position to save a large amount of money that might otherwise have been lost by the non-securing of contracts or the necessity of having to pay an additional freight after the shipments have been made and the transaction closed as far as the shipper is concerned.

The law is such that in case of an undercharge which can not be collected from the consignee, the same must be paid by the consignor; therefore, it is especially important that the traffic department be in a position to quote correct rates at all times.

One of the largest items connected with the zinc industry is that of freight. Many times rates are out of line and combinations should apply that are not applied, unless there is a traffic department that can work these adjustments out.

Many firms have in the past depended upon the rate departments of the railroads to quote the proper rates. The average rate clerk is overworked. He has no interest in taking extra time to see if anything other than the rate quoted by him might apply; whereas there may be a commodity rate or combination rate that is applicable.

However, not having a traffic department to look into these matters the quotations of the rate clerk are accepted, thereby resulting in a considerable difference in the charges paid and what should have been paid.

The revising department of the railroads very seldom corrects an overcharge, their function being to collect undercharges, and, naturally, if these overcharges are not discovered by the shipper, they never will be.

Taking the large amount of tonnage involved and the liability of improper rate quotations into consideration, it would appear that an efficient traffic department is at present as necessary as any other department of the zinc industry.

GEOLOGY at MASCOT

(*From page* 833)

eral association appears constant throughout this depth.

No commercial carbonate ores have been found at Mascot. Apparently the topographic relation at outcrop was not favorable to the concentration of that type of ore.

While faults are known to be present in the locality none of consequence have been found in the immediate vicinity of the ore bodies. In as far as known igneous rocks are absent.

The standing quality of the ground from the view point of mining is excellent. No timbered supports are required. Wherever the presence of shaley partings or of thinly bedded limestones or dolomites indicate doubtful roof conditions such material is taken down until secure ground has been reached. Usually, however, a satisfactory roof may be established wherever grades indicate its proper position.

PROSPECTING

It has been customary to use both diamond and churn drills in surface prospecting. Use of diamond drill permits of visual examination of core recovered and results are gained faster than by the use of churn drills. Churn drilling costs less. Samples from churn drills and diamond drills are given equal weight in analyzing results. The Knox characteristically is a tight formation—natural openings are so few as to have a little adverse effect upon recoveries, either by dia- (*Continued on page* 857)

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*Traffic Manager, American Zinc, Lead and Smelting Co., St. Louis, Mo.

The Factors Which Affect Mechanized Loading

By **G. B. Southward**

There are a number of items which mechanized loading must take into account. A list of these seems rather complicated but all of them have been successfully met by the present operations.

• • •

AS MECHANICAL loading has progressed from the experimental into the operating stage its problems instead of becoming simplified appear to be more complicated. During the experimental period most of the thought and effort was directed toward the mechanical performance of the equipment, but after the machines were perfected their establishment as an integral part of coal mining introduced a number of new operating problems. It has been found that there is in our mining methods and systems no place already prepared for the direct substitution of machines for hand loading and it has further become apparent that there are many more factors which have to be taken into account than was originally supposed. This has all been said before, but it is well worth repeating because on this point depends the improvements over our present operations which are necessary to bring about higher efficiencies and further cost reductions.

The adoption of mechanized loading would be comparatively simple if the application always could be made in new mines in undeveloped territory. A few companies who have been able to do this have been fortunate, but since the existing coal mining operations with their equipment can not be abandoned the problem of mechanization is primarily one of adapting machines to mines now in operation with hand loading.

In general the factors which effect mechanized mining can be divided into a number of main classifications such as (1) physical characteristics of the seam, (2) mining conditions, (3) mining methods, (4) underground development, (5) mining equipment in use, (6) operating methods, (7) labor situation, (8) market requirements. Each of these general classifications must be further subdivided in order to bring out the details and this is shown in the following list:

PHYSICAL CHARACTERISTICS OF THE SEAM:
- a. Height of seam.
- b. Structure of coal.
- c. Amount of impurities.

MINING CONDITIONS:
- a. Pitch of seam.
- b. Character of top.
- c. Character of bottom.
- d. Depth of cover.

MINING METHODS:
- a. Mining system.
- b. Width of working places.
- c. Percentage of extraction.

UNDERGROUND DEVELOPMENT:
- a. Extent of underground workings.
- b. Areas of unmined coal.

MINING EQUIPMENT IN USE:
- a. Mine cars.
- b. Gathering haulage.
- c. Main haulage.
- d. Power.

OPERATING METHODS:
- a. Face preparation.
- b. Gathering haulage.
- c. Main haulage.
- d. Mechanical maintenance.
- e. Ventilation.

LABOR SITUATION:
- a. Type of labor.
- b. Wage scale.

MARKET REQUIREMENTS:
- a. Sizing.
- b. Cleaning.
- c. Market demand.
- d. Selling price.

Since any system of mechanized loading is affected to some degree by all of the items in the list, it necessarily follows that one of two things must be done. The equipment must be adapted to fit the conditions or the conditions must be changed to suit the requirements of the equipment. This much is obvious. It is equally obvious that some of these items are definitely fixed, some are capable of change or modification but at a considerable expense, while some can be easily changed or modified to almost any extent desired. Some difficulty is experienced in differentiating between items which are actually fixed and those which may be regarded as fixed but are in reality only set by custom or tradition. There is also a further difficulty in determining whether the cost of making a proposed change from present practices will be justified by the advantages gained in the operation of the machines.

These questions can not be answered generally, and it would be impossible to take each of the items in the above list and classify them as being either subject or not subject to modification. In any mine, however, that is installing or operating loading equipment it sooner or later becomes necessary to consider each of these things in detail and decide whether or not some change can or should be made. In this connection it may be of interest to see how some of the questions have been answered by mines now mechanized.

THE PHYSICAL CHARACTERISTICS OF THE SEAM can not be changed, but it is in some cases possible to bring about what actually amounts to a change. For instance, a seam with bands of impurities that are all mined with hand loading can sometimes be changed to the equivalent of a clean seam by using low coal equipment and mining only a portion of the seam.

THE MINING CONDITIONS are fairly well fixed, but in some cases bad roof conditions have been improved by top cutting and leaving a certain amount of head coal to protect the roof. In one mine a good roof situation was created by driving "caving chambers" where a roof fall relieved pressure in adjoining workings.

THE MINING METHODS are always capable of modification, but in some cases it may not be practicable to do so. The mining system which includes the width of the working places and percentage of

recovery at any individual property may be designed primarily to suit the physical conditions there. In such instances it may be that the plan in use is the best that can be developed. However, it is more than likely that this applies to a limited number of mines and in the great majority of instances the mining plan has been designed to suit hand loading. Where this is true changes are, of course, possible.

THE UNDERGROUND DEVELOPMENT in any property may be such that the working places can easily be concentrated into a suitable territory for mechanized loading. In other cases it happens that this can not be done and a mechanized operation would have its working places so widely scattered that an effective concentration is impossible. This condition has existed in several mines that are now mechanized and their mechanization was made possible by entirely disregarding the old workings and developing new territory in virgin areas.

THE MINING EQUIPMENT IN USE can all be changed if the loading machinery requires. The important point to be decided is whether the investment necessary for discarding or remodeling would be followed by a justifiable decrease in the operating cost. In a new mine it is equally important to be sure that the haulage and general underground equipment installed will be suitable not only for the proposed operation but also for improvements and increased capacities that can be expected later. The failure to take the possibility of increased future productions into account may have the effect of preventing improvements which would otherwise be possible if they had been anticipated in the original selection of the equipment.

It is generally believed that the mine cars used in hand loading are not adaptable for machine loading where single cars are placed one at a time and it has been the tendency in the majority of operations to increase the car capacity. A few mines which have not wished to incur this expense have been forced to develop a gathering method for making quick changes with cars of small capacity. Varying degrees of success are being had and at the present time one of these operations has succeeded in making over 300 single-car changes behind one loading machine in an eight-hour shift. With this as an example of the possibilities a mine car of small capacity does not have to be regarded as preventing the successful operation of mechanical loading.

Adequate power is essential to a mechanical operation and very few hand loading mines have an underground power system that fits into mechanized loading without some changes. The failure to recognize this has prevented a number of mechanical installations from giving the performance that could otherwise have been expected. There is, however, usually no great difficulty or expense involved in providing for an adequate power supply.

THE OPERATING METHODS as developed for hand loading are all undergoing some changes in the mechanized mines. This fact is well known and there is not sufficient space in this report to discuss these in detail.

THE LABOR SITUATION depends on the character of the men employed and also on their previous experience with machines. In mines that are already partially mechanized there is usually little difficulty in securing men who can serve as machine operators. In other mines where no machinery of any kind had been used previous to the adoption of complete mechanization, it was possible to train the men to machine methods. There is, however, some difficulty getting them used to the idea of group working under discipline, but this is usually overcome and it is generally found that any objection to mechanized mining on the part of labor comes from men who are not employed on the machine crews.

The wage scale has probably had as much influence in determining the installation of equipment as any other single factor, and the greatest growth of machine loading has been in the fields where high wages are paid. There is, of course, not the same amount of direct savings possible by mechanization in the lower wage fields and this has retarded the installation of loading machinery in these districts. However, some direct savings are being made and these, combined with the indirect savings resulting from a greater production per man, the concentration of the working places and the higher percentage of coal recovery, give an advantage over hand methods which should not be overlooked.

THE MARKET REQUIREMENTS for sizes and quality is apt to be fixed, at least for the time being, and mechanized operations must furnish the product desired. In the final analysis the difference between the cost of mining and the selling price of coal determines the practicability of mechanical loading and a change in the methods and facilities for preparation may be required to insure that the operating economies will not be offset by a decreased market value of the product.

This report is not submitted with the idea of magnifying the difficulties of mechanized mining. It is rather with the thought that these points must all be considered sooner or later and their correct solution will hasten the progress which has already been made.

PRACTICAL OPERATING MEN'S DEPARTMENT

METALS

Due to the cooperation of Mr. Guy N. Bjorge in the preparation of the articles on the operations of the American Zinc, Lead and Smelting Company which appear in this issue, the Metals Section of the Practical Operating Men's Department is omitted.

GEOLOGY AT MASCOT

(*From page 855*)

mond or churn drills.

In sampling diamond drill cores all cores throughout the length to be sampled are included in the sample. Diamond drill sludge is not saved. In sampling churn drill holes 3-ft. intervals are used. The bailings from each 3-ft. run are collected in a tub and allowed to settle, after which they are taken to the sampling department where they are dried and cut down and prepared for the laboratory. No sampling other than the gathering of the cuttings as above is attempted at the drill.

Specimen samples of core to represent changes in formation, except in ore, are saved and filed in core boxes. Specimen samples of churn drill cuttings are saved from each 5-ft. run when not in ore, and from each 3-ft. run when in ore. A measured portion of each such sample is treated to remove carbonates. The insoluble residues resulting are mounted on a cardboard record together with untreated cuttings, so that both treated and untreated samples may appear side by side for examination by microscope. Mounting is to scale and continuous, so that a finished card carries a mounted specimen of cuttings from each run, together with its insoluble residue, as well as curves to show volumetric percentages of residue and assays. The study of cuttings so mounted aids in the indentification and correlation of horizons. The use of insolubles in this connection is a follow-up of primary investigations by the Geological Survey of Missouri.

Spacing of drill holes varies from 150 to 200 ft. in attempting to follow out ore and in the primary blocking out of ore. Frequently intermediate follow-up holes are drilled later. Due to the wandering habit of the ore bodies a close following out by geometric spacing of holes usually is not practicable.

Underground prospecting is by diamond drill. Drifts and raises seldom are driven solely for the proving up of ore. Considerable drifting is done to provide diamond drill stations. When a drift or raise cuts ore, grab samples of material passed through are taken for purposes of record. In attempting to prospect extensions of known ore bodies from the deep levels of the mine, drifting to provide underground diamond drill stations is considered good practice. This removes the danger of bad information from possible drifting of surface holes. It is customary to drive crosscuts and drifts in the hanging wall and to drill out by vertical down holes. Cores from underground drilling are sampled in a manner similar to surface cores.

COAL

NEWELL G. ALFORD
Editor

Practical Operating Problems of the Coal Mining Industry

Methods of Educating the Miner

By W. D. BRENNAN †

THE coal mining industry can be bettered by the education of the miner, improved both for the miner himself and the operator.

Coal mining is, and will continue to be, an important and vital industry of the United States. At present its working force is composed largely of incompletely trained and semi-experienced miners, and the training of these men is one of the problems of today.

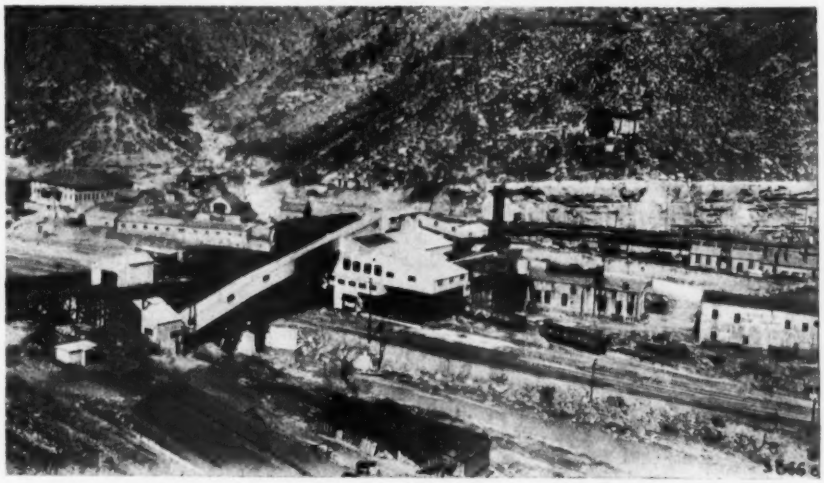
Before the men can be taught the proper methods of doing their work, the bosses must first take each work job and make a job analysis and study all common practices pertaining to each job. By this method bad practices can be eliminated or corrected. Good practices are taught and generally used. Preferred practices are standardized, thus simplifying supervision. It also tends to eliminate misunderstanding and specifically defines responsibility. It discloses opportunities for organized training and improvement, and brings out the more instructional material, which when in written form can be used in training new workers.

When the bosses make the job analysis and agree what should be the accepted way of doing each operation, they put their stamp of approval upon the instructional material based on these practices. The bosses are the keymen and no training program that is not in harmony with their point of view is apt to succeed; therefore, job practices taught to the workers are accepted practices approved by the management.

In the past very little time has been devoted to the common worker and many of the practices which he uses were taught to him by his partner, or picked up from experience, with the result that many of them are faulty. By the elimination of poor practices accidents can be decreased, and it will help the worker by having safer ways of working. The proper way of working is the faster way, hence more pay to the worker. The proper way is also the easiest way. It helps the worker to avoid unpleasant controversies with the bosses by establishing the proper way jobs should be done. It also gives a feeling of confidence in the worker; hence giving him a new pride and satisfaction in doing his work right. Theoretical discussion is avoided as the ordinary workers are not interested except to know the "Why" and "How," and soon tire of subject matter that does not seem closely related to the immediate problem. It is better if the workmen can apply the knowledge as they learn it and put it into immediate practice.

Hand in hand with the job practices are adequate rules and disciplinary procedures.

During the process of hiring, each man is instructed in the company's rules, with special emphasis given to the most important ones. He is instructed that when he reports for work he must have a "protective" or "hard boiled" cap, screen goggles, and shoes with hard protective toe cap, and other tools necessary for his work. When reporting for work he is placed in care of an assistant boss who instructs him in the proper procedure of reporting to the fire boss, checking in, (*Continued on page* 862)



Mines 1 and 2 of the Utah Fuel Company, Castle Gate, Utah

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† President, Utah Fuel Company.

SAFETY ORGANIZATION in a small mine*

By **D. L. Boyle**†

THE organization herein described is that which is in effect at Penelec No. 5 Mine, Seward, Pa., a town situated 10 miles northwest of Johnstown. The mine is a captive operation supplying the needs of the Seward Station of the Associated Gas and Electric System, of which system both are integral parts. The station has a capacity of 40,000 kw. and consumes approprimately 15,000 tons of coal monthly.

The seam of coal mined is the B-Miller or Lower Kittanning. In this area, it is gaseous, 42 inches thick, generally flat, and has overlying it a 2-in. to 4-in. band of boney. Low flat rolls and roof spars intercept the regularity of the fire clay bottom and slate roof. The coal is relatively hard, there being no tendency to break off, and where pillars are being extracted the hardness is somewhat increased. The overburden ranges from 180 ft. to 300 ft., and there is approximately 28 ft. of slate cover between the coal and sand rock. Sand rock thickness varies upward to the extent of 52 ft. Some little trouble is experienced from roof conditions, as fissures and cutters make the hard slate independable.

Both the advance and full retreat systems of room and pillar mining are used. Cutting is done with 50-hp. machines which are approved by the United States Bureau of Mines. These machines cut approximately 90 percent of the total tonnage. When mined, the coal is hand loaded and hauled to the shaft bottom by means of electric locomotives. It is then sent to the surface through a double compartment shaft which is equipped with automatic feeds and self-dumping cages. Outside of the mine, the coal is dumped into steel hoppers and transported to the plant by steam traction locomotives.

Ventilation is furnished by means of a 9-ft. Sirocco fan which exhausts from the mine 140,000 cu. ft. of air per minute. The total is divided into six splits, all of which have in excess of 15,000 cu. ft. on the intake. Stoppings along the main and flat entries are constructed of brick. Stoppings on room entries are built of gob rock. In all entries, no more than the last two cutthroughs are allowed open at any time, the outby cutthrough open for switching and must be temporarily checked. Extra protection is provided against an explosion hazard in that the mine is completely rock dusted and is one of the few mines in the State of Pennsylvania receiving full credit from the compensation rating bureau for this protective measure.

Underground, in the various sections, are first-aid stations which contain all necessary emergency equipment, such as first-aid supplies, self-rescuers and All Service Masks. Self-rescuers are also provided at the mouths of all entries. These are placed in locked boxes which are cached in the rib. Surface equipment includes a modern equipped mine rescue and training station.

It has been the aim of the company to equip, maintain and operate the mine in as safe a condition as possible and every possible effort has been put forth to reduce accidents. This might be conveniently set forth when cited, that at the time of acquisition, during the year 1920, the compensation rate paid was $3.04 per $100 pay roll, which was far in excess of the average bituminous rating of $2.52. One year after the date of acquisition, the rate was reduced to $1.35, as compared to the average bituminous mine rating of $2.27. At the present time our adjusted rate is $1.88, which compares favorably with low rated mines in this field.

Organization

Accidents occurring over a period of eight (8) years were analyzed, which analysis showed that a major portion of the accidents could be imputed to failure and inability on the part of the workman. To eliminate these causes and materially reduce the ultimate cost of production, it was decided to include with the supervising safety methods, educational work giving the employe a training in fundamentals. Considerable thought was given to just how work could be presented. It was finally decided that through consistent contact this could be accomplished. The aim of the contact being to keep safety in the foreground at all times, and by the continual supervision and instruction to build up the immediate supervisor to propagate this work.

The accompanying chart shows the scheme of organization and a description of its various parts.

Mine Officials

The local officials, superintendent of mines, safety engineer, and engineer have duties which are, of course, found in other organizations, plus those as illustrated in the organization chart. In addition, two rounds of their section is required of assistant foreman. Shot firers are required to visit all places working on their section twice each day, regardless of the amount of shooting required. These men, while not invested with authority, other than the control of places to be shot, report to the assistant and keep him well informed at all times of the status of each place.

Employe's School

In the public school building of the town, the mining engineer conducts a night school for employes. This school meets two nights a week, six months out of a year, which are usually the six months preceding state examinations. It has been the practice to teach the fundamental mining subjects, and as far as possible coordinate the instruction with the practical training given the men following their occupation. It is pleasing to report that practically all the officials of the mine at one time have attended this school prior to the time of their serving in an official capacity, and it might be termed that these men are a product of the combined school and mine training that has been offered.

Joseph A. Holmes Society

It was evident, after several years of work with the Foreman's Safety Council, that there was still a vast area that remained untouched, meaning that in our efforts we had failed to reach certain members of the organization. In a mining community, like any other, there are some who, while not employed as officials, have in them qualities of leadership. To influence and direct this leadership in the proper channel, or to have it coordinated with the leadership of others, was considered more economic than to allow it to go by unnoticed or to be misdirected.

The organization scheme of the Joseph A. Holmes Society is such that numerous individuals are permitted to take an active part. It also provides some diversity for the men. Upon request, the United States Bureau of Mines organized the Chapter, which has been quite active since. Programs are arranged,

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† Superintendent of Mines, Penelec Coal Corporation.

which include with the instructive talks and pictures, music and other entertaining features. Officers and directors are taken from the mine personnel. Officials take only an active part when acting as advisor or when taking part in the program.

First Aid and Mine Rescue

In years previous to 1929 we had in effect a policy whereby we trained only a sufficient number of mine rescue and first-aid men to answer all emergency calls and to have distributed about the mine good practical first aid men. In the year 1929, we realized that it was through this medium that we could lay the foundation for safety training, so it was with this in view that we started to enlarge on our program, and in the same year the employes of the mine were 100 percent trained in first aid work, and all men physically able were trained in mine rescue work.

In order to follow up the work, we have at the present time, one evening each month in which all day men, officials and as many other employes as we can get, are required to attend first aid meetings. At these meetings, the majority of the time is spent in a review of first aid work, but to associate first aid work with accidents, it is the policy of the instructor to describe certain accidents and their resultant injuries, and have the men take care of the patient whom it is assumed is the victim of the circumstances resulting from the accident.

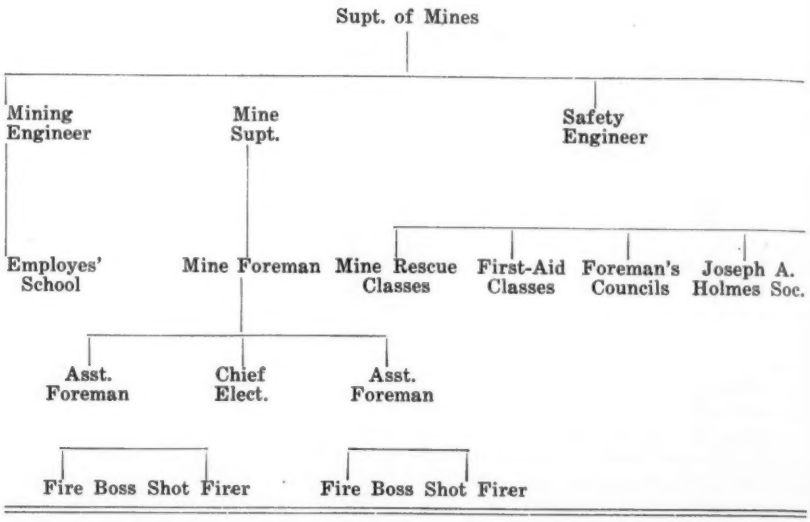
At the present time, and during the last year 36 men have been trained in mine rescue work. Not only are these men trained in the use and care of the apparatus, but they are given the advanced course in mine rescue which is prescribed by the United States Bureau of Mines. Essential to the work followed in this course is equipment, which can hardly be termed as equipment necessary in a mine rescue station, as it is almost an impossibility to have all rescue men skilled in the use of such apparatus, but when we consider that it might at some time or other be the duty of some of these men to serve as rescue crews, we can assume that the valuable experience obtained on such occasions can only be absorbed when these men are equipped with a suitable foundation.

Then again during the past several years, examinations for state mine inspectors, mine foremen, assistant foreman and fire boss have taken into consideration very much material pertaining to this phase of mine work, and it can be readily seen that to give men a very thorough knowledge of recovery work is not only beneficial to the company, but a benefit to the men.

Conclusion

Whether or not safety in a small mine is any different than safety in a large mine is in the writer's mind somewhat hazy. Safety, we readily admit, is so closely allied with economy that we make no attempt to shatter the relationship. Economy is essential in both large and small operations. The use of the word "Safety" too often reflects only a meaning of conservation of life and limb, and too often we forget that to supervise more thoroughly the human at work means added supervision to property.

ORGANIZATION CHART
Showing Contact



To show the close relationship between safety and economy, let us use for example a particular problem in ventilation at this mine. During the latter part of 1928, it was particularly noticeable that some changes were necessary. In fact, the ventilation was becoming rapidly inadequate. A survey was made of all airways taking into consideration the many factors that affect the flow of air. The amount of increase of air and power consumption necessary to supply the additional amount were estimated. After much study it was decided to decrease the pressure on the existing ventilating apparatus. This was done by eliminating certain airways, increasing the area of tight places and rounding out abrupt corners.

This work, when completed, made it possible to circulate 140,000 cu. ft. of air per minute with the same water gauge that was required to circulate 85,000 cu. ft. The total cost of making these changes was $3,500. To circulate the same amount or 140,000 cu. ft. of air at the estimated increase of water gauge would have cost $8,000 per year for power consumption only. In this particular instance, the safest way, or ventilation with a low pressure is by far the more economical.

To instil safety in the minds of the employes requires a continuity of attack and usually terminates in a speciality of personnel work, as geological conditions, equipment, and nature of mining usually govern the extent of routine safety. Then to further the cause of accident prevention we must delve with the individual, and if we are so desired, and completely sold on the project, we know and study all individuals.

Safety in itself is not a high pressure means of extracting from the employe ideas, nor does it curb any inclination of the man to advance. An operator or employer before he can show dividends, must first invest, likewise must he do something to impart to the individual a feeling of surety and sincerity before he can ever hope to have in return loyalty. In this mine before acquired by its present owners, there occurred two explosions resulting in the loss of eight and three lives. Subsequent to purchase, labor turnover was extremely high. Labor turnover means accident to life and property. Accidents cost money, and if the money spent on the safety has only reduced our turnover to its present degree, it has been well invested.

Easy it is to formulate a bulk of alibis when results haven't been obtained, and easy to enumerate the many factors we consider so necessary before a safety organization can function and obtain results. But to me, the one and important prerequisite is the man who is in a position to say yes or no. It is he that is responsible for the final results, and to him all responsibility for accidents can be traced. The more willing he is to accept excuses, the higher accident frequency he will have.

PROTECTIVE CLOTHING
*in accident prevention work**

By C. L. LUTTON †

THE use of protective wearing apparel by underground coal mine workers as a safeguard against injury from some of the inherent hazards peculiar to that industry and as an additional protection against omission of the human element to consistently function properly, thereby indirectly causing injury to certain parts of the body has, within the past few years, met with commendable success in some mining districts where it has been applied. Probably the greatest progress in the prevention of injuries by the practical application of this type of material has been made by the use of eye protectors (goggles) by underground workers while performing certain classes of work hazardous to the eyes from flying chips of material.

The major number of this class of injuries occur in connection with the use of hand tools—particularly coal picks, sledge hammers and axes when workmen are mining, dislodging or fracturing coal, slate or rock, and in connection with the installation of roof supports, haulage tracks, etc. The handling of material where mud, water, or dust is present also contributes to foreign bodies in eyes of workmen.

Some years ago, a mining company with extensive operations in western Pennsylvania were experiencing an alarming number of disabling eye injuries to employes. The majority of the alleged causes were attributed to flying coal from the pick, slate from hammers, etc. During the years 1924-1925, that company experienced a disabling eye injury accident rate (per 100 full time workers, two-year period) of 5.20 percent. The management seriously considered the introduction of goggles for use by some classes of underground workers while performing certain classes of work known to be hazardous to the eyes. Wire screen and glass lens type goggles were selected and submitted to eye specialists for tests to determine the probability of their use affecting the vision of the wearer. Upon being informed that the use of goggles was not detrimental to vision, it was decided to conduct an extensive educational campaign among mine officials and workmen regarding the advantage of the protective features and their practical application. The campaign was conducted during the year 1926, and early in the year 1927, they were required to wear goggles when performing certain classes of work. The disabling eye injury accident rate experienced during the two-year period (1926-1927) was 1.42 percent per 100 full time employes. During the two-year period (1928-1929), the use of goggles having been thoroughly established, the eye aecident rate of 5.20 percent experienced in the years 1924-1925 before goggles were used.

U. S. Bureau of Mines photo.

Colonial Dock of the H. C. Frick Coke Company on the Monongahela River near Scottsdale, Pa., fed by a four and one-third mile conveyor from three mines

It is worthy of mention that notwithstanding the advancement of numerous theories that the wearing of goggles would expose underground workmen to other hazards and indirectly cause more serious or fatal injuries from other causes, during the four years of experience with the use of goggles underground, not a single injury from other causes was attributable directly or indirectly to the wearing of goggles, except in two or three instances in which wire screen type goggles with broken wires were struck by flying material and the ends of the broken wires punctured the flesh or eye of the wearer.

Other mining companies have experienced equally as favorable results in the prevention of eye injuries to underground workmen by the use of goggles.

Experience has determined that the wire screen type goggles is not as durable or as adaptable for mine work as the glass lens type goggle.

Regulations promulgated by the Department of Labor and Industry, Commonwealth of Pennsylvania, require the wearing of eye protectors by workmen exposed to eye injury in industrial plants that come within the jurisdiction of the department; but the wearing of eye protectors by underground coal mine workers has not been generally adopted notwithstanding the large number of eye injuries occurring to mine workers.

In the introduction of safety toe shoes to underground mine workers as a protection against injury from falling material in connection with mining, handling coal, slate, rock, and other classes of mine material, some difficulty was encountered due to the fact that a large percentage of underground workers in many mines wear rubber bootees which were not, until recently, manufactured with safety toe protection caps. It required considerable time to be consumed in experimental work in connection with the manufacture of bootees of this type that would provide maximum protection and not cause discomfort to the wearer. Many changes were made from time to time, until, thanks to the cooperation of the manufacturers — finally about two years ago — a fairly satisfactory safety toe rubber bootee was obtainable. Since that time, their use became more popular.

Records are not available to determine accurately to what extent the use of safety toe shoes have

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† Safety Director, H. C. Frick Coal Company.

contributed to the prevention of toe injuries. There are, however, records of many instances where large pieces of coal, slate or rock, steel rails, mine timbers, and other materials fell striking the safety toe caps, causing no injury to the toes of the wearer; and in other instances, the toes were injured because of the great weight of material striking the toe cap, but the extent of the injury was undoubtedly mitigated. In some cases where the wheels of mine transportation equipment ran over the safety shoe cap, the toes of the wearer were fractured, but in all probability would have been amputated had non-safety toe shoes been worn.

One mine in western Pennsylvania employing approximately 600 full time workers, who had been equipped 100 percent with safety toe shoes for the past 19 months, have experienced one disabling toe injury during that time.

The management of one large mining company with operations located in western and central Pennsylvania and northern West Virginia, were so favorably impressed with the protective features of safety toe shoes that they decided to require all employes exposed to foot and toe injuries to wear this type of footwear while at work. Their employes were finally equipped 100 percent with this type of footwear in April of this year. The company experienced a reduction of 66 percent in the number of foot and toe injuries during the first seven months of this year compared with the same period of 1929.

There is at least one feature in connection with the manufacture of rubber footwear adaptable for use by underground mine workers that should receive the attention and serious consideration of manufacturers, namely, the providing of non-slip material in the soles and heels. It has been conclusively proven that many injuries of a very serious nature, in some cases fatal, have been caused indirectly by persons slipping while performing dangerous work, especially when workmen are walking or standing on wet fire clay, or horseback formations, inclined rock, etc., due to the fact that after the corrugation of the sole and heels on new rubber footwear is worn smooth, they provide very insecure and treacherous footing. The heels wear off to about the same level as the sole under the arch of the foot in much less time than is required to wear the sole out under the ball of the foot, developing very unsafe footwear for mine work where safety of individuals necessitates surefootedness to insure the safe performance of certain classes of work requiring accurate, agile foot movements.

Safety toe leather shoes probably provide more protection from toe injuries, slipping, tripping, etc., and are more adaptable for use in dry mines than other types of footwear. Rubber footwear should not be worn in coal mines where conditions are favorable for the use of leather. Excessive wearing of rubber footwear by miners develops fallen arches, tender feet, etc., because of the extreme flexibility of the material.

To the best knowledge of the writer, the introduction of the use of hard hats by underground coal mine workers is in its infancy. However, I am informed that they have recently been adopted for use in some coal mines and are extensively used in some metal and ore mines with very satisfactory results—there being records of numerous instances where fatal or serious injuries were avoided when falling material struck the hard hat of the wearer.

The hats are manufactured of a lightweight non-conductive material, designed to protect the head from injury from any blow that the neck can withstand, and when properly designed will not cause head injuries by compression if forcibly driven down on the head by falling objects.

The wearing of gloves in some instances provides protection; in others, they create a hazard. The practice of wearing loose-fitting gloves tends to increase injuries to persons handling material and those of the gauntlet type catch on projections and are particularly dangerous for use by workmen around moving machinery and transportation equipment. The wearing of wet, slimy gloves tends to increase injuries to workmen when using hand tools. The use of neat-fitting gloves, manufactured of proper material with close-fitting wrist bands, provides protection against many lacerations, abrasions and puncture wounds of the hands and fingers.

There is a demand developing among mine workers for a legging that will provide protection to the leg below the knee. It should be so constructed as to absorb shocks to which the leg is subjected from rolling or sliding pieces of strata, and from being struck against projecting materials.

The utilizing of adaptable protective wearing apparel in connection with the prevention of accidents to mine workers is largely a matter of education of officials and workmen relative to the protective features against injury from some unavoidable occurrence or omissions on the part of individuals.

EDUCATING THE MINER

(*From page* 858)

and how to receive his lamp, etc. He is instructed to search himself thoroughly and make sure he has divested himself of all matches, cigars, cigarettes, or pipe. He is also instructed how to return his lamp when coming off shift, and how to check out, much emphasis being placed on the importance of checking out.

He is then shown the mantrip and instructed never to get on or off while it is in motion, to sit down in the car and keep his hands or arms from the top of the cars. After leaving the mantrip he is accompanied to his working place by the assistant boss who explains the reason why the men should travel on the clearance side of the entry away from all power lines, as there is danger of tools touching them and the man receiving a shock. When entering his working place he is instructed how to look for dangerous conditions along the roadway, how the fire boss would deadline the place if dangerous, at the same time explaining why it would be deadlined, and never to cross over said deadline until a boss or fire boss removes it. He is shown how to pick out a safe place to leave his lunch bucket and coat. When approaching the working face he is instructed by demonstration how to test the roof by tapping lightly with the butt end of a pick and sometimes supplementing this by holding the other hand against the roof to feel for any vibration. He is told how the fire boss marks loose roof, or where props are needed, and to look for these marks. When loose roof is found or marked he must first either pull it down or place props to secure it. He is shown how to pull loose roof down by using a bar instead of a pick and if the seam is above his height how to stand on a secure footing instead of using an empty nail keg or other insecure platform. He is told how to obtain more props or other material when he needs it, and is shown how to block the car securely at the face before starting to load.

Such jobs as timbering require much instruction, for instance, how to prepare a place for a prop, how to measure for it, the proper way to prepare to cut it, how to square the ends with either axe or saw, and how to use these tools properly. How to make a square or angle cut and how to brace the timber for sawing, how it can be braced with an axe or against another timber, how to make the initial saw cut by not placing his hand alongside the blade, but on top of the blade to guide it, at the same time keeping the hand away from the coarse teeth. This is followed by instructions how to make a cap-piece, explaining why a large cap-piece should be used in preference to a small one, why it should be square on two sides instead of round to get a good bearing on the prop. When shaping the cap-piece it should be placed on a good foundation where there is sufficient head room to swing the axe, and position for chopping should be such that a glancing blow of the axe would not catch the foot (*Continued on page* 875)

Eighth Annual MEETING *of* WESTERN DIVISION

Western Division, American Mining Congress and American Institute of Mining Engineers Hold Joint Meeting at El Paso—West Texas Geological Society, American Association of Engineers and the Centro Nacional de Ingenieros de Mexico Participate—Tri-State District Selected for Next Meeting and Charles F. Dike Elected Chairman

THE joint meeting of the Western Division of the American Mining Congress, and the American Institute of Mining and Metallurgical Engineers, with the West Texas Geological Society, the American Association of Engineers and the Centro Nacional de Ingenieros de Mexico, participating, made El Paso the mecca for mining men from the western states and from northern Mexico on October 13-14-15-16, 1930. The meeting was one of unusual interest and set a record for attendance at similar meetings in the West.

All sessions were held, and entertainment provided, at the Hotel Paso del Norte in El Paso. Special entertainment features had also been arranged at Juarez, Mexico.

The opening session on Monday morning, October 13, was called to order with Brent N. Rickard, governor of the Western Division of the American Mining Congress, presiding. Mr. Rickard welcomed the visitors in behalf of the Western Division and of the mining men of El Paso and the Southwest and then presented R. E. Thomasen, mayor of El Paso, who extended the official welcome of El Paso and its citizens. J. Quevado, Sr. Presidente Municipal de Juarez, extended the welcome or "Bienvenido" of the city of Juarez. Greetings from the El Paso Chamber of Commerce were brought by Edgar W. Kayser, its president. Greetings and wishes for the success of the meeting from the Secretary of Industry of Mexico and from the Centro Nacional de Ingenieros de Mexico, in session at Durango, were given by Sr. Gustavo P. Serrano and Sr. Javier Horquesitas, their official representatives.

Three governors, John C. Phillips for Arizona, R. C. Dillon for New Mexico, and Dan Moody for Texas, sent greetings to the convention. President Hoover wired, regretting that he was unable to be present because he was "on shift in Washington."

J. F. Callbreath, Secretary of the American Mining Congress, responded for the visitors and expressed appreciation for the very cordial welcome extended by all. Mr. Callbreath then outlined the history of the American Mining Congress, its organization and its aims, and cited some of its accomplishments. He pointed out the fact that the first convention of the American Mining Congress with which he had anything to do was held in El Paso just 25 years ago and then compared the progress and growth of El Paso with that of the Mining Congress. In the quarter century, the population of El Paso has multiplied by four and its assessed valuation has increased sevenfold. Twenty-five years ago the Mining Congress was at its very beginning and in that period it has grown to the organization which now represents the interests of the mining industry in so many ways.

Frank M. Smith, smelter director, Bunker Hill and Sullivan Mining and Concentrating Company, of Spokane, Wash., addressed the convention on the subject of "Silver—What About Its Future." In this he summed up the production of silver and the relation of its value to that of gold throughout history. The relation between the present low price of silver and our reduced exports because of the decreased purchasing power of the countries of the orient was stressed. Benefits that would accrue to the producers of a variety of commodities through the stabilization of China were pointed out. This paper is printed in full elsewhere in this issue.

Western Division Elects Officers

Following the morning session the Board of Governors of the American Mining Congress met at luncheon for the transaction of business. The following officers were elected for the ensuing year:

Arizona: T. H. O'Brien, Inspiration; and W. B. Gohring, Phoenix.

California: Philip Wisement, Los Angeles; and G. Chester Brown, San Francisco.

Colorado: Jesse F. McDonald, Leadville; and C. Lorimer Colburn, Denver.

Idaho: J. F. McCarty, Wallace; and Axel P. Ramstedt, Wallace.

Montana: W. B. Daly and Major C. L. Berrien, Butte.

Nevada: J. C. Kinnear, McGill; and Henry M. Rives, Reno.

New Mexico: J. M. Sully, Hurley; and J. F. Woodbury, Silver City.

Oregon: Robert M. Betts, Black Butte; and A. W. Strowger,, Portland.

South Dakota: B. C. Yates and R. G. Wayland, Lead.

Texas: Brent N. Rickard and Howard H. Fields, El Paso.

Utah: Oscar Friendly and A. G. McKenzie, Salt Lake City.

Washington: Frank M. Smith, Spokane; and Milnor Roberts, Seattle.

Tri-State District: C. F. Dike, Cardin; and M. D. Harbaugh, Miami.

Alaska: Maurice D. Leehey and Charles D. Garfield, Seattle.

W. T. Landrum, of Picher, Okla., presented an invitation to hold the meeting next year at Joplin and the Tri-State District. This was supported by wire from M. D. Harbaugh who had been delayed and could not arrive in El Paso until the following day. This invitation was accepted and Joplin selected for next year's meeting. C. F. Dike was elected chairman of the Board of Governors of the Western Division with M. D. Harbaugh as secretary.

Operating Problems in Arizona Discussed

The afternoon session was given over to a discussion of operating problems in Arizona with T. H. O'Brien, Governor of the Arizona Chapter, presiding. W. V. De Camp, general manager, United Verde Copper Company, Clarkdale, Ariz., gave a timely address on "Management In Its Responsibility to Industry." He stated that it was the responsibility of management to so plan the operations of industry that the extreme peaks of prosperity and depression might be awarded. With particular respect to the mining industry he concluded as follows: "The American Min-

ing Congress is the logical organization to undertake the thorough study that is necessary if any progress along the line of stabilization in our metal industry is ever to be made; and, gentlemen, it can not come through legislation, but must come through the only possible channel open to it—the education of each operator to a realization of the seriousness of his problem. Following this realization must come the setting up of the necessary program that will permit its partial accomplishment, keeping always in mind that the answer lies with the individual producer and the degree of sanity and wisdom and fairness he is willing to exhibit for the benefit of the industry as a whole. He should be strengthened further by the realization that should he fail, then that multitude of faithful employes whom he so carelessly cast aside when they are not needed may take this matter into their own hands. Such a result would lead the producer along paths that end in strict legislative action, and to a degree of control of his operation that would be drastic and fatal to the future of all industry within his own borders, and a bar to the extension of foreign trade so vital to the general situation."

Other papers presented were as follows:

"Mineral Resources of the Southwest," by Julius Kruttschnitt, Jr., formerly manager, Southwestern Mining Department, American Smelting and Refining Company, Tucson, Ariz., presented by B. R. Hacher who is Mr. Kruttschnitt's successor.

"Development and Mining at Inspiration Consolidated Copper Company, Inspiration, Arizona," by A. C. Stoddard, assistant mine superintendent, Inspiration Consolidated Copper Company.

"Long Hole Prospect Drilling at the Ray Mines of the Nevada Consolidated Copper Company," by Moses Brown, Jr., assistant superintendent, Ray Mines, Nevada Consolidated Copper Company.

"Résumé of the History of the Copper Queen Branch, Phelps Dodge Corporation," by J. B. Pullen, engineer, Phelps Dodge Corporation.

A. I. M. E. Meetings

Meetings of the American Institute of Mining and Metallurgical Engineers were held on Tuesday. At the morning session, H. L. Carr, secretary of the El Paso Section, presided. W. H. Bassett, president of the Institute, was introduced and expressed his appreciation for the reception accorded everyone in attendance at the El Paso meeting.

The following technical papers were then presented:

"Concentration of Oxidized Lead Ores at the San Diego Mill of the Santa Barbara Unit, Cia. Minera Asarco, Santa Barbara, Chihuahua, Mexico," by Augustus J. Monks and Norman L. Weiss.

"Milling Practice at the San Francisco Mines of Mexico, Ltd., San Francisco del Oro, Chihuahua, Mexico," by Glen L. Allen.

"Top Slicing with Filling of Slices as Used at the Charcas Unit of the Cia. Minera Asarco, Charcas, San Luis Potosi, Mexico," by Howard Willey.

"Critical Factors Controlling Ore Deposition in Limestones of Northern Mexico," by John G. Barry.

The last paper described in a general way the geology of this Mexican Province and gave certain opinions as to the genesis of the deposits in limestone based on the author's extensive experience in this region and elsewhere. This paper brought forth lively discussion and some differences of opinion. Marden W. Hayward, geologist for the Peñoles Company; Thomas P. Clendennin, geologist for the American Smelting and Refining Company, and J. J. Beeson, consulting geologist of Salt Lake City, took part in the discussion.

E. P. Mathewson, chairman of the Arizona Section of the American Institute of Mining and Metallurgical Engineers, presided at the afternoon session. The following papers were presented:

"The El Paso Refinery of the Nichols Copper Company," by Frank R. Corwin and Carlton Harloff.

"Natural Gas Firing at the El Paso Smelting Works of the American Smelting and Refining Company," by E. R. Marble.

"Mining Methods and Costs at the Presidio Mine of the American Metal Company of Texas," by Van Dyne Hawbert and Richard Basuslaw.

"Milling Methods and Costs at the Presidio Mine of the American Metal Company of Texas," by Van Dyne Hawbert and Fred E. Gray.

David Cole briefly discussed "Recent Developments in Primary Crushing," as he had been unable to complete his paper on the subject in time for the meeting.

Robert E. Tally Nominated for Presidency of Institute

On Tuesday evening, directors of the American Institute of Mining and Metallurgical Engineers and a limited number of invited guests met at dinner. W. H. Bassett, president of the Institute, gave an interesting talk on his swing around the west to visit the various sections. Karl Eilers, of New York; Milnor Roberts, of Seattle, and C. V. Millikan, of Tulsa, talked of Institute affairs in their respective sections. An open meeting of the Institute directors followed the dinner. At this meeting the nominations of Robert E. Tally for president of the Institute and L. S. Cates for director were announced.

Meetings of Participating Societies

The morning session on Wednesday was divided between the three participating societies, namely, the West Texas Geological Society, the American Association of Engineers, El Paso Chapter, and the Centro Nacional de Ingenieros de Mexico.

At the meeting of the West Texas Geological Society, Edgar Kraus, chairman of that organization, presided. Dr. H. P. Bybee gave a comprehensive review of the "General Geologic Features of West Texas and New Mexico with Special Reference to Petroleum Accumulations." A lively discussion followed and the time proved far too limited for adequate presentation or discussion of this broad subject.

J. E. Gamewell, president of the El Paso Chapter, presided at the meeting of the American Association of Engineers. Dr. G. M. Butler, dean of the College of Mines and Engineering at the University of Arizona, addressed the meeting on the "Aims and Objects of the American Association of Engineers." He reviewed the history of the Association from its organization and made a plea for its support by all engineers.

Sr. Ing. Gustavo P. Serrano, Commissioner for Mexico of the United States and Mexico Boundary Survey, presided at the meeting of the Centro Nacional de Ingenieros de Mexico. A meeting of the Mexican engineers in Durango had originally been planned for a later date but a change had become necessary in order that President Ortiz Rubio might be present. The Durango meeting was, however, held concurrently with the El Paso meeting and only a few delegated representatives of the Centro Nacional de Ingenieros could be at El Paso. Greetings from the Mexican engineers were brought by Sr. Serrano and Sr. Horquesitas.

A very interesting and instructive paper on "Mining Incorporations in Mexico," by Lic. Alberto Terrones Benitez, Acting Governor of the State of Durango, Mexico, was presented by Sr. Ing. Gustavo P. Serrano.

Sir Javier Horquesitas gave a brief discussion of the new mining laws of Mexico.

Operating Problems in New Mexico

E. H. Wells, president of the New Mexico School of Mines, presided at the Wednesday afternoon session of the Western Division of The American Mining Congress. At this session operating problems in New Mexico were discussed. The following papers were presented:

"Methods of Determining Metallurgical and Efficiency Results at the Selective Flotation Mill of the Black Hawk Mines Company," by Ira L. Wright, manager, Black Hawk Consolidated Mines Company.

"Mining Practice at the Pecos Mine of the American Metal Company of New Mexico," by J. T. Matson, manager, and C. Hoog, mine superintendent, Pecos Mine, American Metal Company.

(This paper was prepared for and published by the United States Bureau of Mines.)

"A Sandstone Copper Deposit," by I. J. Stauber, Pastura, New Mexico.

Following the presentation and discussion of these papers the report of the Committee on Resolutions was presented.

Resolutions Adopted

Frank M. Smith, of Spokane, Wash., was chairman of the Resolutions Committee, the other members of which were: H. A. Clark, Warren, Ariz.; Guy N. Bjorge, San Francisco, Calif.; E. H. Wells, Socorro, N. Mex.; R. G. Wayland, Lead, S. Dak.; Brent N. Rickard, El Paso, Tex.; W. T. Landrum, Picher, Okla.; J. J. Beeson, Salt Lake City, Utah. Sr. Gustavo P. Serrano represented Mexico at the meetings of the resolutions committee.

The following resolutions were presented and adopted:

Resolution No. 1

Introduced by the Resolutions Committee

The Western Division of The American Mining Congress in convention assembled at El Paso, Tex., October 13-15, 1930, hereby recommends for adoption by the Board of Directors of The American Mining Congress the following resolution:

WHEREAS, The loss of timber by fires in the United States amounting to millions of dollars annually, and the losses by floods and soil erosion should be prevented to the fullest extent possible; and

WHEREAS, Adequate forest protection requires such road and station construction as will make quickly accessible every part of the Forest Reserves, in order that fires may be extinguished at incipient and before reaching the conflagration stage, which entails enormous loss of timber and great danger to towns near the forest area, together with enormous fire suppression expense; and

WHEREAS, The building of necessary roads and trails making possible quick action with incipient fires will make possible great economies of administration, and more perfect protection of forests; and

WHEREAS, The 7,449 fires in the National Forests during 1929 burned over 978,107 acres, entailed losses estimated at $5,831,838, to suppress which cost the service $3,400,403, while the costs of fire prevention, including money spent for official administration, the building of roads, trails and stations amounted to $1,954,372: Now therefore be it

Resolved, That more money should be spent for fire prevention in order that these immense losses may be prevented; and be it further

Resolved, That we approve and endorse the principles of the Englebright bill (H. R. 3245) and recommend that Congress speedily make provision for its enactment.

Resolution No. 2

Introduced by R. G. Wayland, South Dakota

The Western Division of The American Mining Congress in convention assembled at El Paso, Tex., October 13-15, 1930, hereby recommends for adoption by the Board of Directors of The American Mining Congress the following resolution:

WHEREAS, The Norbeck bill (S. 3774) restricts the locator of future mining claims, both patented and unpatented, upon the National Forests of South Dakota to the use of only so much of the surface of his claims as may be "reasonably necessary" in the judgment of the Forest Officer; and

WHEREAS, No mining company would place a plant costing millions of dollars upon ground which it did not own and control, and the effect of this bill would therefore seriously handicap future mining operations upon Forest Lands in South Dakota; and

WHEREAS, The abuses which this bill aims to correct can be corrected much more easily by other methods without injury to the mining industry, and at less expense; and

WHEREAS, The forests of the Black Hills of South Dakota are small and unimportant in timber resources, while they afford one-eighth of the annual gold production of the United States and contain vast deposits of other minerals; and

WHEREAS, The American Mining Congress has always opposed the separation of the surface and mineral rights on mining claims: Therefore be it

Resolved, That The American Mining Congress is unalterably opposed to the enactment of any law or the promulgation of any rules and regulations which would curtail the rights now enjoyed by American citizens in the prospecting, exploitation and utilization of mineral rights, as such laws and regulations are detrimental to the best interests of the mining industry and the state.

Resolution No. 3

Introduced by Frank M. Smith, Spokane, Wash.

The Western Division of The American Mining Congress in convention assembled at El Paso, Tex., October 13-15, 1930, hereby recommends for adoption by the Board of Directors of The American Mining Congress the following resolution:

WHEREAS, The production of tobacco, cotton, oil, lumber, wheat flour and very many other basic commodities within the United States exceeds possible domestic consumption to such extent that a failure to market this excess necessarily results in idleness of both labor and capital; and

WHEREAS, The nations of the Far East offer the most promising field for the marketing of our surplus production of such basic commodities; and

WHEREAS, The buying power of these nations which comprise one-half the population of the world, has been greatly reduced by internal dissensions and the lack of accepted and stable governments, and especially by the decline in world silver prices which has within recent years reduced by more than one-half the visible wealth of those peoples, and thereby correspondingly reduced their purchasing power; and

WHEREAS, The inability of the recognized heads of the Chinese Government to finance their administrations has resulted in unstable government, continuous internal dissensions, frequent revolutions, and untold suffering by the people of that vast country; and

WHEREAS, Under S. Res. 256 of the 71st Congress, a subcommittee of the Senate Committee on Foreign Relations has been authorized to study and report on

(a) Stipulations relating to commerce in existing treaties of the United States and other governments with the Republic of China; and

(b) Conditions that may affect our commerce and trade with China; and

WHEREAS, At the hearings of this subcommittee so far held in Washington, D. C., San Francisco, Los Angeles and Seattle, testimony of expert witnesses and exporters familiar with our trade in China clearly indicate that the decline

in our export trade with China has been coincident with the decline in the price of silver; and

WHEREAS, The consensus of opinion of these witnesses seems to be that the pacification of China must be the first step to remedy this unfortunate condition, and that perhaps this could be best accomplished by the principal Treaty Powers, including the United States, financing the Nationalist Government of China by means of a joint loan to China of five hundred million ounces of silver, or as much thereof as may be needed, and to be delivered perhaps in the form of coin of small denominations, as and when needed; and

WHEREAS, It appears that thus adequately financed, the Nationalist Government of China would soon be able to control the situation, and that internal warfare would cease, and the people, once relieved of the necessity of fighting for a living, would return to their homes and resume their gainful occupations, or else would be given employment in the building of roads and in other public works; and

WHEREAS, It is believed that this would immediately result in the movement to the interior of the vast accumulation of silver now on deposit for safe keeping in banks at Shanghai and other Treaty Ports, and that increased demand for more silver would naturally follow; and

WHEREAS, Under these conditions silver would rapidly increase in price, the effect of which would be immediately reflected in an increased purchasing power of the Chinese people, thus enabling them to buy more of our goods and gradually restore our export trade with the Chinese nation: Now therefore be it

Resolved, By the Western Division of The American Mining Congress in session at El Paso, Tex., October 13-15, 1930, that we heartily commend the work of the Senate Subcommittee engaged in the study of our Export Trade with China, and express the hope that as a result of their investigations some constructive plan along the lines suggested by the expert witnesses may be adopted by the Subcommittee, approved by the Senate, and submitted to the President for such appropriate action as he deems wise and proper in the circumstances.

RESOLUTION NO. 4

Introduced by R. H. Sayre, Colorado

The Western Division of The American Mining Congress in convention assembled at El Paso, Tex., October 13-15, 1930, hereby recommends for adoption by the Board of Directors of The American Mining Congress the following resolution:

WHEREAS, Much valuable field work of the United States Geological Survey and the United States Bureau of Mines remains unavailable to the mining industry because of insufficient appropriations for the prompt printing of same; and

WHEREAS, Many scientific reports of inestimable value are now out of print and unobtainable, for the same reason; and

WHEREAS, Scientific information of this type, developed by these scientific bodies, if available, furnishes a background for more intelligent development, and if obtainable would effect great economies in operation which because of lack of such information are liable to grave mistakes and costly expenditures; and

WHEREAS, All intelligent industrial development must be based upon the most accurate knowledge possible, and great economic waste results from delayed publication of these data, including the Mineral Resources figures from year to year: Therefore be it

Resolved, That the Western Division of the American Mining Congress urges the Governmental Administration to make increased appropriations for the early publication of such scientific knowledge and of such data as are anxiously awaited by the mining industry, including topographic mapping, geological examinations, stream gaging records, Mineral Resources Statistics, and the reprinting of such selected reports of value as are now out of print.

RESOLUTION NO. 5

Introduced by Resolutions Committee

The Western Division of The American Mining Congress in convention assembled at El Paso, Tex., October 13-15, 1930, hereby recommends for adoption by the Board of Directors of The American Mining Congress the following resolution:

WHEREAS, The session of the Western Division of The American Mining Congress now about to end, has been one of exceptional profit and enjoyment to all who have participated therein: Therefore be it

Resolved, That the thanks of the Division and of The American Mining Congress be extended to the people and city officers of the cities of El Paso and Juarez, to the officials of the Mexican Government, to the companies cooperating with the local committee, to the hotels of the city for their courteous hospitality, to the newspapers for their courteous and complete publicity, to the several associations participating in the session, to the speakers for their distinct contributions to our program, and more particularly to Messrs. Rickard and Fields and the committees working with them for their untiring labors in making this an outstanding meeting of the Division, and to the ladies of El Paso and Juarez for their delightful contributions to our entertainment and that of the ladies attending the convention.

A COLORFUL MEETING

In a social way the meeting at El Paso was indeed a colorful one. Proximity to Mexico suggested the motif for decorations and entertainment. An atmosphere of informality and good fellowship was instilled into each new arrival as all were decked out in large Mexican sombreros. These were worn by practically all on the first day and they were in evidence throughout the meeting. In the late afternoon of the firs tday the gathering moved en masse to the Juarez Brewery Gardens, Juarez, Chihuahua, Mexico, for the barbecue and Spanish fiesta. A Spanish barbecue supper was served. Entertainment included an exhibition of Juege de Rebote or Mexican handball game, Spanish dances, boxing matches and cock fights.

On Tuesday a luncheon was tendered all the visiting delegates at the Hotel Hussmann. Spanish dancing furnished entertainment during luncheon. A picturesque pair of old prospectors with a pair of burros brought a picture of an earlier day. Incidentally, the discovery was made that the burro is not surefooted on a ballroom floor.

ANNUAL BANQUET

The El Paso meeting closed with a banquet of the Western Division, American Mining Congress and the American Institute of Mining and Metallurgical Engineers at the Hotel Paso del Norte on Wednesday evening. At this banquet the large ballroom of the Paso del Norte was taxed to its utmost. The men from El Paso were all in Mexican Caballero costumes which gave an added touch of color. Unique favors made at the El Paso Smelting Works were presented to every guest. These were ash trays in the form of Mexican sombreros with the brim of lead bullion and the crown of copper bullion.

Cleon T. Knapp, attorney for the Calumet and Arizona Mining Company at Warren, Ariz., acted as toastmaster. An address of welcome was delivered by J. Walker Morrow, and his inimitable Southern stories were greatly appreciated.

A response for the American Institute of Mining and Metallurgical Engineers was made by W. H. Bassett, president. He outlined the aims and objects of the Institute in promoting the profession of engineering.

Dr. Henry Mace Payne, of The American Mining Congress, outlined the objects of that organization and reviewed its services to the mining industry.

Sr. Ing. Gustavo P. Serrano spoke for Mexico and asked The Mining Congress and the Institute to earnestly consider the possibility of holding a meeting in Mexico City within the next few years. He sketched the numerous points of interest to the mining engineer in and near Mexico City.

Mexican songs, Mexican dancers and a Mexican orchestra furnished excellent entertainment.

The banquet was followed by dancing. During the dance, motion pictures taken at various stages of the convention were shown.

LADIES' ENTERTAINMENT

In addition to the barbeque and Spanish fiesta and the banquet and ball, the visiting ladies were given a luncheon at El Central at Juarez on Tuesday. Wednesday was Ladies' Country Club Day and there was golf or bridge according to choice, and (*Continued on page* 875)

American Metal Acquires Shares of Roan Antelope and Rhodesian Selection

The American Metal Company has acquired from the Canadian Selection Company, Ltd., 800,000 English ordinary shares of the Roan Antelope Copper Mines, Ltd., and 1,000,000 ordinary shares of Rhodesian Selection Trust, Ltd., in exchange for 350,000 shares of the common stock of the American Metal Company and $1,000,000 in cash, it was announced October 15. It was explained that these 350,000 shares of stock would not be entitled to dividends until after December 1, 1932, and that application had been made for their listing on the New York Stock Exchange.

The Roan Antelope Mine in Northern Rhodesia is expected to begin production in the second half of 1931, the announcement said. The Rhodesian Selection Trust owns a two-thirds interest in special grants covering approximately 140,342 acres in the Northern Rhodesia copper belt and also owns approximately 65 percent interest in Mufulira Copper Mines, Ltd., which is expected to reach production the latter part of 1932.

Plans for the erection of an electrolytic refinery in England in association with other Rhodesian mining companies have been discussed, but have not matured.

The shares of the Roan Antelope and the Rhodesian Selection Trust were acquired by the Canadian Selection Company, which was incorporated last June, from the Selection Trust, Ltd., of London, which went into voluntary liquidation on September 25, 1930. In the winding up of this trust the Canadian Selection Company, the holder of all the ordinary share capital, is receiving the whole of the net assets of Selection Trust.

The new board of directors of the Canadian Selection Company consists of Robert C. Beatty, partner of the law firm of Norris, Plante & Saxe; Arthur H. Bunker, vice president of the Lehman Corporation; Harold K. Hochschild, vice president of the American Metal Company; Dorsey Richardson, director of the Lehman Corporation, and Otto Sussman, president of the American Metal Company.

Says Idaho Mine Tax Not High Enough

Byron Defenbach, Idaho state treasurer, stated October 3 that mines and capital stock of banks were not being taxed properly, with the result that Idaho loses much money, in an address at Lewiston.

Of mine taxation, he said, "the next legislature will be forced to take some action along the lines of requiring our profitable mines to pay taxes something like other property payers in Idaho and like mines themselves pay in our neighboring states."

He said there was a lower taxation rate on mines in Idaho than any other state in the United States.

GOLD, SILVER, COPPER, LEAD, AND ZINC IN ARIZONA IN 1929

(In terms of recovered or recoverable metal)

ADVANCE FIGURES BY C. N. GERRY, OF THE UNITED STATES BUREAU OF MINES

County	No. producers	Gold,* fine ozs.	Silver,* fine ozs.	Copper, lbs.	Lead, lbs.	Zinc, lbs.	Total value
Cochise	41	70,696.53	2,416,945	186,983,144	3,139,485	47,120	$35,859,590
Coconino	5	9.33	564	202,520	1,000	.....	36,201
Gila	39	7,236.32	327,502	196,789,955	5,951,967	.....	35,334,152
Graham	5	9.77	7,548	23,436	247,925	.....	23,969
Greenlee	6	4,235.81	118,867	57,094,667	.....	.....	10,199,579
Maricopa	17	2,012.74	67,394	264,453	1,553,860	.....	221,965
Mohave	44	7,144.12	33,429	24,926	161,417	133,414	188,861
Pima	61	15,025.90	215,255	73,861,331	817,904	.....	13,476,409
Pinal	40	10,147.53	1,240,771	105,817,156	679,569	.....	19,537,731
Santa Cruz	38	1,891.27	283,047	1,057,700	3,275,876	2,278,046	732,846
Yavapai	81	81,918.42	2,810,859	208,171,605	153,613	.....	39,839,473
Yuma	35	1,990.39	21,102	337,518	72,406	.....	116,357
Total, 1929	412	202,318.13	7,543,283	830,628,411	16,054,122	2,458,580	† 155,567,133
Total, 1928	320	191,927.23	6,791,351	732,276,803	14,380,964	1,278,636	‡ 114,300,381

* Includes placer production.

†Average value of metals: Gold, $20.671835 per ounce; silver, $0.533 per ounce; copper, $0.176 per pound; lead, $0.063 per pound; zinc, $0.066 per pound.

‡Average value of metals: Gold, $20.671835 per ounce; silver, $0.585 per ounce; copper, $0.144 per pound; lead, $0.058 per pound; zinc, $0.061 per pound.

Federal Mining & Smelting Purchases American Zinc, Lead & Smelting Holdings

Approximately 7,500 acres of mining land in and near Granby, which in 1916 was sold for $7,500,000, was bought by the Federal Mining and Smelting Company. No consideration was given, but it is understood that the American Zinc, Lead and Smelting Company received less than $400,000 for the land.

The American paid the Granby Mining and Smelting Company $6,500,000 in cash and $1,000,000 in ten-year bonds for the Granby land in June, 1926.

The Granby lead smelter, which has been idle for about seven years, which was included in the original deal, is not included in the present transaction.

The Federal Company has had a lease on the Granby acreage for several years. A mill was built on the land several years ago, after a good zinc mine was developed. The mine was operated for more than a year and showed a good recovery. When the district was in need of curtailment the Federal Company closed its Granby property with others and it has never been reopened.

Jackling To Receive the Saunders Medal

The William Lawrence Saunders gold medal for 1930, awarded annually for achievement in mining by the American Institute of Mining and Metallurgical Engineers, will be presented to Daniel C. Jackling, of San Francisco, president of the Utah Copper Company and other mining corporations, at a dinner on October 31 at the Ritz-Carlton Hotel, New York, it was announced by H. Foster Bain, secretary of the Institute.

President Hoover received the Saunders medal in 1928, and the award was made last year to John Hays Hammond. Mr. Jackling, who was born in Missouri in 1869, began his engineering career as professor of chemistry and metallurgy at the Missouri School of Mines in 1891, a post he held until 1893. He was chemist and metallurgist of the Cripple Creek District, Colorado, from 1894 to 1896. From 1896 to 1900 he was in charge of construction and operation of the metallurgical works of the Consolidated Mercur Gold Mines in Utah. He organized the Utah Copper Company and became its president in 1903.

Manganese Association To Meet November 10 and 11

The Third Annual Convention of the American Manganese Producers' Association will be held at the Mayflower Hotel, Washington, D. C., November 10 and 11, 1930.

The program of the two-day session will embody reports from the manganese districts, discussions of the newer methods of beneficiation, market conditions, transportation and the world manganese situation.

The banquet and entertainment on the evening of November 10 will be devoted to a discussion of the Russian situation and its effect upon American industries and labor. Among the speakers and special guests of the evening will be internationally known individuals interested in the Russian situation, representatives of the American industries vitally affected by the present program of Soviet Russia and representatives of the leading patriotic societies. Mr. James W. Gerard, former Ambassador to Germany, will preside as toastmaster.

The convention this year promises to be of unusual interest, coming as it does at a rather strategic time in the life of the domestic manganese industry. The tariff question has been settled, but the dumping of Soviet manganese ores on the American market is now under discussion.

The program covers subjects of outstanding importance to the industry at this time, including the following: The Russian situation and effect of the five-year dumping program on manganese and other American industries; the world manganese situation; possibilities of the domestic market, with particular emphasis on manufacture of ferro-manganese and commercial use of manganese in fertilizer; major developments in the newer beneficiation of lower grade ores; reports from each of the manganese states.

Fire Fighting Equipment Standards Approved

"Fire-Fighting Equipment in Metal Mines" was approved October 14, 1930, by the American Standards Association as standard. These recommendations covering fire-fighting equipment, preventive measures, fire signals and fire-fighting personnel in metal mines were developed by a committee of the American Mining Congress under the chairmanship of W. V. DeCamp, general manager of the United Verde Copper Company. Appointed joint sponsors with the American Mining Congress in the project under the procedure of the American Standards Association, the National Fire Protection Association then assisted; a sectional committee which, in this case, acted largely as a revising committee, was organized. It consisted of representatives of NEMA, American Association for Labor Legislation, National Safety Council, Railway Fire Protection Association, Fire-Equipment Institute, Rubber Association of America, Mine Safety Appliances Company, U. S. Bureau of Mines, National Board of Fire Underwriters, National Fire Protection Association and the American Institute of Mining and Metallurgical Engineers.

This standard, developed by a large and representative committee and now approved as a national standard, should be adopted and put into use in metal mines throughout the country as the best possible fire insurance obtainable. Copies may be obtained from the American Mining Congress and the American Standards Association.

Samuel Newhouse Dies

Samuel Newhouse, one of the great pioneer mining men of Colorado and other Rocky Mountain states, died September 22 at his apartments near Paris, France. He was 77 years old.

Mr. Newhouse was born October 14, 1853, in New York City, and received his early education in the public schools and later graduated in law in 1878. He was admitted to the bar but never practiced.

In 1879, the year the great boom developed in Leadville, he migrated to the famous camp of the carbonates. Later he went to Ouray in the Colorado San Juan.

After two or three years in Ouray, Mr. Newhouse came to Denver in 1888 and conceived the idea of draining the entire mining district from Idaho Springs to Central City with a great tunnel five miles long, now called the Argo Tunnel. Mr. Newhouse was instrumental in financing the mine now famous as the Highland Boy in Bingham Canyon.

He originated and became president of the Denver, Lakewood & Golden Railroad. He was also president of the Boston Consolidated Copper Mining Company, the Newhouse Mining and Smelting Company and the Nipissing Silver Mines Company in Canada.

In Salt Lake Mr. Newhouse built the two tallest business blocks of the city and followed that up by building the Newhouse Hotel, now one of the largest hostelries of the Utah capital. For years every civic movement of a patriotic or philanthropic character began with Samuel Newhouse and no man was better beloved by his fellow citizens.

Perfect Safety Records Turned In By Phelps Dodge Branches for September

Hanging up a perfect record for the first time, the Stag Canon Branch of the Phelph Dodge Corporation tied with the Morenci unit in the monthly safety contest conducted by the five branches of the corporation during September.

The five branches are believed to have reached a new minimum figure for a month's period during September with only six time-lost accidents marked up against all of the units of the corporation.

The Moctezuma Branch of Nacozari, Mexico, was in second place for the

MINE PRODUCTION OF GOLD, SILVER, COPPER, LEAD, AND ZINC IN MONTANA IN 1929

(In terms of recovered or recoverable metal)

ADVANCE FIGURES BY C. N. GERRY, OF THE UNITED STATES BUREAU OF MINES

County	No. producers	Gold,* fine ozs.	Silver,* fine ozs.	Copper, lbs.	Lead, lbs.	Zinc, lbs.	Total value
Beaverhead	9	240.76	45,366	62,704	847,788	.....	$93,604
Broadwater	22	839.26	46,396	12,224	2,412,941	97,525	202,681
Cascade	5	82.43	157,503	399,911	985,225	109,156	225,310
Deer Lodge	6	551.53	645	778	.....	.....	11,882
Flathead	2	44.02	885,528	1,997	.....	.....	473,249
Granite	14	1,183.30	557,687	316,402	928,978	5,237,025	781,565
Jefferson	34	1,856.73	180,062	157,380	1,975,024	2,827,213	473,077
Judith Basin	6	699.55	784,186	293,301	12,274,961	7,770,524	1,770,231
Lewis and Clark	30	12,558.39	43,835	12,627	1,716,473	18,986,927	1,646,466
Lincoln	6	72.90	4,908	155	156,638	33,208	16,210
Madison	47	10,067.27	67,702	142,015	1,156,213	4,174	342,305
Meagher	2	.....	6	6,606	.....	.....	1,166
Mineral	8	178.84	6,706	925	94,811	145,021	22,978
Missoula	5	19.79	161	690	2,451	.....	770
Park	2	10.69	14,739	76	166,749	.....	18,595
Phillips	2	57.08	64	31	.....	.....	1,219
Powell	16	225.19	754	693	10,968	.....	5,870
Ravalli	2	8.85	1,823	1,181	5,912	40,456	4,406
Sanders	1	2.42	.....	.....	.....	.....	50
Silver Bow	38	26,059.03	9,918,906	296,316,277	16,478,575	101,100,505	65,687,913
Total, 1929	252	54,758.03	12,716,977	297,725,973	39,213,707	136,351,734	† 71,779,547
Total, 1928	279	58,196.09	10,853,276	248,262,027	33,759,644	165,660,189	‡ 55,365,249

* Includes placer production.

†Average value of metals: Gold, $20.671835 per ounce; silver, $0.533 per ounce; copper, $0.176 per pound; lead, $0.063 per pound; zinc, $0.066 per pound.

‡Average value of metals: Gold, $20.671835 per ounce; silver, $0.585 per ounce; copper, $0.144 per pound; lead, $0.058 per pound; zinc, $0.061 per pound.

month with two time-lost accidents and the Old Dominion in third place with one time-lost mishap. The Copper Queen for the first time in months ranked last, but had only three time-lost accidents in all of its departments.

Three of the six time-lost accidents for the month occurred in the underground mining department, the Copper Queen recording one in this division and the Moctezuma its only two.

Only 73 accidents have occurred at the five branches in all departments during the safety contest since January 1, with the Morenci Branch leading in the competition for the year to date with but 10 accidents. The next three branches are close together, with the Old Dominion second for the year to date with eight time-lost mishaps; the Copper Queen third with 25, and the Moctezuma fourth with 18. The Stag Canon unit is last for the year with 12 time-lost accidents.

Based on 1,000 shifts worked, the average of the Morenci Branch for the year to date is .031; the Old Dominion, .040; the Copper Queen, .046; the Moctezuma, .049, and the Stag Canon, .0148.

Mining and Electrical Engineering Courses Most Popular at Michigan College

Mining and electrical engineering are the most popular courses at the Michigan College of Mining and Technology, according to the distribution of students in the various branches of engineering. Out of a total enrollment of 542 students, the largest in the history of the institution, 119 elected mining engineering and 110 electrical engineering.

The number of students enrolled in other courses at the college this year are: Metallurgy, 96; mechanical engineering, 77; civil engineering, 72; chemical engineering, 29; geology, 14; chemistry, 11; general engineering, 8; and unclassified, 6.

A new building, costing more than $300,000, is rapidly nearing completion to take care of the increased enrollment in mechanical and electrical engineering. The wing which will house the electrical engineering department is practically complete, and classes are now meeting in the new laboratories.

The section of the building which will be occupied by the mechanical engineering department will be completed before the first of the year.

Tri-State Operators Meet—Elect C. A. Neal President

The Tri-State Zinc and Lead Ore Producers Association held their seventh annual meeting at Picher, Okla., on October 22. The feature of the meeting was an address by J. F. Callbreath, secretary of The American Mining Congress, who outlined the efforts of The Mining Congress in working out a plan by which production of the various minerals in the United States can be stabilized to meet the market demands.

The Tri-State District is losing from one-half to two-thirds of its wealth when it sells zinc concentrates at the present price, Mr. Callbreath said, and it was the endeavor of The Mining Congress, through a committee composed of the leading members of the various sections of the mining industry, to work out a plan of stabilization that would enable the mining industry to obtain a fair price for its products.

The mining industry is faced with a revision of the depletion act at the next session of Congress, Mr. Callbreath stated, that might mean much to the industry.

President Frank Childress presided at the meeting.

Activities of the Association for the past year were outlined in the report of M. D. Harbaugh, secretary. The slump in the industry, he said, has worked a hardship on the Association, but its activities have proceeded almost as usual and it is hoped that they shall continue to do so.

Work of the safety division of the organization was outlined by Fred Nesbitt, accident prevention engineer, who also reported on the progress being made at the Schifferdecker Lead and Zinc Museum.

A remarkable reduction in the number of silicotics in the district has been made since the opening of the Picher Co-Operative Clinic, Dr. F. V. Meriwether, clinic director, reported.

The Association had an anticipated revenue of approximately $46,634 for the year, according to a report made by Charles A. Neal, treasurer, while the expenditures were $61,807. Although the expenditures have greatly exceeded the income, the expenses have been several thousand dollars less than the budget for the year, despite the fact that $4,000 was devoted to the welfare work last winter, an item that was not included in the budget. The Association still has a cash reserve of more than $20,000 to tide it over the present stringency, the report indicated.

Short talks were made by A. Scott Thompson, Representative Charles O'Connor, of Oklahoma, and J. W. Daniels.

C. A. Neal Is Elected President of Association

Charles A. Neal, of Miami, manager of the Wright Mining and Royalty Company, was elected president of the Association to succeed Frank Childress at a meeting of the board of directors held October 28. Mr. Neal was the treasurer of the Association the past year.

George Potter, vice president of the Eagle-Picher Mining and Smelting Corporation, was elected first vice president and W. T. Landrum, manager of the Cortez-King Brand Mines Corporation, was elected second vice president. L. G. Johnson, superintendent of the Federal Mining and Smelting Company, was elected treasurer. M. D. Harbaugh was selected as secretary for the coming year.

Dr. Eugene A. Stephenson, formerly of Pittsburgh, Pa., where he was associated with Ralph E. Davis as consulting geologist and engineer engaged in petroleum work, has accepted the position of professor of petroleum production at the Missouri School of Mines, beginning this fall. Dr. Stephenson has had extensive experience in the petroleum field, coupled with a successful teaching record immediately after his college days.

MINE PRODUCTION OF GOLD, SILVER, COPPER, LEAD AND ZINC IN UTAH IN 1929

(In terms of recovered or recoverable metal)

ADVANCE FIGURES BY C. N. GERRY, OF THE UNITED STATES BUREAU OF MINES

County	No. producers	Gold,* fine ozs.	Silver,* fine ozs.	Copper, lbs.	Lead, lbs.	Zinc, lbs.	Total value
Beaver	10	235.30	72,060	76,477	2,118,175	1,288,591	$275,224
Box Elder	3	.....	88	20,205	8,238	.....	4,122
Grand	1	4.26	2	.....	.....	.....	89
Juab	24	14,079.64	2,496,199	2,446,000	18,014,746	492,803	3,219,476
Millard	1	.....	13	.....	3,349	.....	219
Piute	5	937.41	7,955	5,443	19,667	.....	25,815
Salt Lake	28	161,027.21	4,675,321	311,950,443	99,242,873	43,675,758	69,858,853
San Juan	2	41.02	88	51,773	.....	.....	10,007
Sevier	1	.....	.....	.....	683	25,652	1,736
Summit	6	3,953.50	3,371,426	1,589,801	44,086,667	16,460,364	6,022,345
Tooele	24	6,541.36	387,441	329,750	23,599,238	1,048,727	1,955,732
Uintah	2	1.98	28	5,898	.....	.....	1,094
Utah	16	36,789.86	3,795,685	790,733	70,607,492	558,242	7,407,869
Wasatch	5	16,768.61	2,786,075	934,523	41,053,301	39,469,348	7,187,427
Washington	2	39.43	15	81,477	.....	.....	15,163
Total, 1929	130	240,419.63	17,592,396	318,282,523	298,754,429	103,019,485	† 95,985,201
Total, 1928	124	212,559.79	17,072,852	293,235,039	291,830,021	93,857,352	‡ 97,258,904

* Includes placer production.

†Average value of metals: Gold, $20.671835 per ounce; silver, $0.533 per ounce; copper, $0.176 per pound; lead, $0.063 per pound; zinc, $0.066 per pound.

‡Average value of metals: Gold, $20.671835 per ounce; silver, $0.585 per ounce; copper, $0.144 per pound; lead, $0.058 per pound; zinc, $0.061 per pound.

United Verde Company Options Ground In Arizona Area

The United Verde Copper Company has taken under option the large properties of the Cibola Exploration Company in the Superior-Miami District, Arizona, where extensive diamond drilling was done during the early part of 1929.

This is the second option of importance in that district, the Sixty-Four Mine, near Miami, having been optioned to the United Verde a short time ago. The total property covered by the Cibola option amounts to over 300 claims, or 6,000 acres.

The Cibola Exploration Company is owned by the Dudley interests of Duluth, who last year put down two deep diamond drill holes alongside of the Miami-Superior Highway between Pinal Ranch and Devil's Canyon.

F. E. Calkins, consulting engineer and geologist, who negotiated the deal, states that though the property is only a prospect, it offers a very good chance.

C. & A. To Install New Hoist at Junction Shaft

A new electric hoist, larger than that recently installed at its Campbell shaft, has been ordered by Calumet & Arizona Mining to replace the steam unit now in operation at its Junction shaft. Until the installation of the new Campbell hoist, all C. & A. ore was raised through the Junction shaft, but the development of the high-grade Campbell ore body made equipment of the Campbell shaft for hoisting necessary.

Shipment of the hoist and its accessory equipment to Bisbee will be made shortly after January 1. It will have ultimate hoisting depth of 5,000 feet. Inasmuch as the Campbell shaft is now down to only 2,340 feet, and the Junction shaft to 2,200 feet, the ultimate hoisting depths for which both hoists are designed is an indication of the company's confidence in the continuation of its ore bodies at depth. Because of the high cost of keeping the workings unwatered, only four to five years' ore reserves are maintained definitely in sight at the property.

Eight Tri-State Properties Work Nine Months Without Accident

Five mines and three retreatment plants in the Tri-State District have operated through the first nine months of 1930 without a lost-time accident, according to records of the accident-prevention department of the Tri-State Zinc and Lead Ore Producers' Association.

The properties are: Foch float plant of the Canam Metals Corporation; Scammon Hill, Webber, West Side, and Wilbur Mines of the Commerce Mining and Royalty Company; Bendelari Mine of the Eagle-Picher Mining and Smelting Company; Dayton tailing mill of the Missouri-Kansas Zinc Corporation; No. 3 tailing mill of the St. Louis Smelting and Refining Company.

Thirty-three properties in the district worked through September without a lost-time accident.

Mining Revival at Tucson, Ariz.

Tucson and Pima County, Ariz., will be host for the fifth of a state-wide series of Arizona mining revivals October 31 and November 1, 2. The department of mines of the Tucson Chamber of Commerce will conduct the revival with the cooperation of several state organizations which have sponsored the series.

Cooperating organizations are the Arizona Industrial Congress, Arizona chapter of the American Mining Congress, the Arizona section of the American Institute of Mining and Metallurgical Engineers and the College of Mines and Engineering at the University of Arizona.

The purpose of the revival is to bring together prospectors, small mine operators, mining campany representatives and business men to discuss non-technical mining problems and general mining development. It is expected that the meeting will stimulate interest in the future of mining and its relation to Tucson and the state as a whole, and make people in general more conscious of the importance of this industry to the county and state.

A. J. Harshberger, president of the department of mines, Tucson Chamber of Commerce, is general chairman of the committee in charge. Committee chairman were named at a meeting held in Tucson during September.

A large number of prospectors and small operators from all over southern Arizona are expected to attend. Business sessions the first two days will be held in the Safford School Auditorium. On the final day a trip will be made to the New Cornelia branch of the Calumet and Arizona mines at Ajo, where that company will be host for the day.

Four previous successful revivals have been held at Yuma, Nogales, Prescott and Kingman.

Metal Freight Rate Hearings at St. Louis November 18

When the Interstate Commerce Commission resumes its hearings in the freight rate structure on nonferrous metals at St. Louis on November 18 it will consider the economic and rate phases of the Missouri-Kansas-Oklahoma lead and zinc situation. Testimony may also be received on the Wisconsin zinc industry. The Tri-State Lead and Zinc Ore Producers Association will represent the shippers of this district at the St. Louis hearing. Representative Manlove, of Missouri, has expressed an interest in the case, as he represents a part of the Tri-State district, the Joplin region, in Congress. E. J. Sawbridge, of Platteville, will represent the zinc industry of Wisconsin at the St. Louis hearing.

After the St. Louis hearing, the case will again be considered at a hearing in New York, beginning December 10 and continuing for probably two weeks. Wholesalers and exporters of new and scrap metals in Massachusetts will ask the commission to make certain inter-

MINE PRODUCTION OF GOLD, SILVER, COPPER, LEAD AND ZINC IN NEVADA IN 1929

(In terms of recovered or recoverable metal)

ADVANCE FIGURES BY VICTOR C. HEIKES, OF THE UNITED STATES BUREAU OF MINES

County	No. producers	Gold,* fine ozs.	Silver,* fine ozs.	Copper, lbs.	Lead, lbs.	Zinc, lbs.	Total value
Churchill	3	13.96	3,147	498	140,315	.....	$10,894
Clark	23	1,566.29	21,022	47,000	1,080,457	1,236,702	201,546
Douglas	3	11.95	476	9,787	3,448	.....	2,441
Elko	37	34,700.23	331,094	727,768	1,604,176	64,124	1,127,172
Esmeralda	27	22,201.94	774,131	20,962	58,342	.....	878,932
Eureka	10	2,397.36	521,610	41,917	1,191,478	17,270	411,156
Humboldt	12	1,297.69	40,194	23,539	7,076	.....	52,838
Lander	28	1,342.28	234,713	2,457,290	135,891	.....	593,893
Lincoln	8	1,830.32	852,241	2,652,115	10,894,251	12,995,496	2,502,893
Lyon	20	1,671.61	59,308	3,283,349	6,197	.....	644,425
Mineral	33	2,009.22	37,167	56,536	40,036	10,779	74,527
Nye	55	24,187.37	1,713,229	3,835	3,982,904	2,605,378	1,836,701
Ormsby	2	7.68	67	1,634	.....	.....	483
Pershing	19	666.28	55,944	27 975	36,102	.....	50,789
Storey	13	5,315.40	32,399	2,611	.....	.....	127,608
Washoe	14	111.25	1,917	7,724	12,361	.....	5,460
White Pine	31	64,380.39	244,867	130,774,269	499,534	.....	24,509,117
Total, 1929	338	163,711.22	4,923,526	140,138,809	19,692,568	16,929,749	† 33,030,875
Total, 1928	359	175,157.79	5,481,574	158,876,883	15,747,444	6,796,713	‡ 31,033,776

* Includes placer production.

†Average value of metals: Gold, $20.671835 per ounce; silver, $0.533 per ounce; copper, $0.176 per pound; lead, $0.063 per pound; zinc, $0.066 per pound.

‡Average value of metals: Gold, $20.671835 per ounce; silver, $0.585 per ounce; copper, $0.144 per pound; lead, $0.058 per pound; zinc, $0.061 per pound.

pretations of the rates and regulations. The Board of Harbor Commissioners of Los Angeles is among the latest of interested parties to intervene in the case.

The Rico Argentine Mining Company, of Salt Lake, advised the commission that on account of the low metal prices it is unable to ship lead-zinc ores at a profit under the present freight rate which is $1 per ton higher than last year. The company is working on plans for financing extensive developments, which may be delayed by a freight advance.

To date 3,843 pages of testimony have been taken in the investigation, in addition to a large quantity of statistical and other exhibits. The hearings have also been marked by clashes between attorneys representing the shippers and railroads. One attorney objected to what he described as "prompting witnesses, and apparent intimidation." Referring to an alleged faulty record of the proceedings, by their failure to include certain data, he suggested that unless the hearings are conducted in a more fitting manner and fully and fairly reported, it will be useless for the small, independent shippers to spend more time and money on them.

"Reduce Competition" is Hoover's Advice to Coal Industry

"Reduction of destructive competition" in the bituminous coal industry and the revision of "our regulatory laws" was recommended by President Hoover in an address at Boston, October 6, before the convention of the American Federation of Labor.

After discussing the readjustment of industry and labor caused by new discoveries and inventions, the President said:

"It is this process of readjustment that partly causes our present difficulties in the bituminous-coal industry. In that industry the encroachments of electrical power, of natural gas, of improvements in consumption, have operated to slow down the annual demand from its high peak, leaving a most excessive production capacity. At the same time, the introduction of labor-saving devices has decreased the demand for mine labor. In addition to its other difficulties must be counted the effect of the multitude of 6,000 independent mine owners among 7,000 mines, which has resulted in destructive competition and final breakdown of wages.

"All these conditions have culminated in a demoralization of the industry and a depth of human misery in some sections which is wholly out of place in our American system. The situation has been under investigation of our Government departments, by Congress, together with commissions and committees of one sort or another, for the past 10 years. The facts are known. One key to solution seems to me to lie in reduction of this destructive competition. It certainly is not the purpose of our competitive system that it should produce a competition which destroys stability in an industry and reduces to poverty all those within it. Its purpose is rather to maintain that degree of competition which induces progress and protects the consumer. If our regulatory laws be at fault, they should be revised."

J. S. McKeever Heads Kanawha Operators

The annual meeting of the Kanawha Coal Operators' Association was held at Charleston, W. Va., Thursday, October 2. Col. W. M. Wiley, who has headed the association for two years, presided, and these officers were elected: J. S. McKeever, general superintendent, Kanawha & Hocking Coal & Coke Co., Longacre, W. Va., president; W. H. Pettus, president, Colcord Coal Co., Montcoal, W. Va., vice president; John L. Dickinson, vice president, Dickinson Fuel Co., Charleston, treasurer; and D. C. Kennedy, executive secretary. All members of the board of directors were reelected, namely, Messrs. C. A. Cabell, J. D. Christian, F. O. Harris, John Laing, J. S. McKeever, W. C. Mitchell, W. H. Pettus, P. C. Thomas, and W. M. Wiley. New members of the board are Messrs. F. L. Hornickel, Cleveland, president, Anchor Coal Company, and Garner Williams, Kayford, W. Va., general manager, Cabin Creek Consolidated Coal Company.

Canadian Coal Rates

The Canadian Government has extended until the end of March, 1932, the period under which coal mined in the Maritime Provinces may be moved into Ontario and Quebec markets under the special test rates now in operation. These rates were originally granted to expire at the end of March, 1931.

NATIONAL COAL ASSOCIATION HOLDS RECORD MEETING AT DETROIT

With a record attendance of 604, the thirteenth annual meeting of the National Coal Association was held in Detroit, October 15, 16 and 17, marked by an intense interest in the exceptionally fine addresses and papers that featured the program, which reflected a keenness for every available bit of information that might be helpful to the industry in solving its problems.

C. E. Bockus, president and chairman of the Board of directors of the Clinchfield Coal Corporation, was reelected president of the organization. Other officers were reelected, as follows: Vice presidents, W. H. Cunningham, Rice Miller, J. W. Searles, and J. F. Welborn; Treasurer, W. D. Ord; Assistant Secretary and Assistant Treasurer, C. C. Crowe; and Executive Secretary, C. B. Huntress.

The personnel of the directorate remains unchanged save for the fact that Charles A. Owen, President, Imperial Coal Corp., New York City, and Chairman of the Annual Meeting Committee, succeeds H. F. Bovard, President, Keystone Coal & Coke Company, Greensburg, Pa., and Charles O'Neill, Vice President in Charge of Sales, Peale, Peacock & Kerr, Inc., New York City, succeeds Rembrandt Peale, of St. Benedict, Pa., the president of that company.

Recommendation of the treasurer that the assessment for the ensuing year be continued at one mill per ton of production was unanimously approved by the directors.

In his report as president of the Coal Association Mr. Bockus expressed the hope that the bituminous industry would soon see "better days." In view of its demoralized condition during the preceding three years, he said, the decline in coal during the recent business depression was less spectacular than in other lines. Mr. Bockus sounded a note of optimism based on the growth of the realization on the part of bituminous coal operators that it behooves them from a dollar-and-cents standpoint of work together.

Prediction of an early resumption of an upward trend in bituminous consumption was made before the convention by J. B. Dilworth, of the d'Invilliers Engineering Company of Philadelphia. T. Duff Smith, of Cleveland, Lake Forwarding Agent of the Canadian National Railways, in speaking of relations between coal producers and railroads as affected by the International Railway Fuel Association, advocated continued cooperation between coal producers and railroads with a view of providing proper fuel at reasonable prices. He said the demand of railroads for better prepared fuel has benefited coal operators by requiring them to pay closer attention to the product, resulting in a cleaner coal which aids in competing with oil and gas.

In opposing legislation before Congress to restrict courts from issuing injunctions in labor disputes, Henry Adamson, Attorney, of Terre Haute, Indiana, declared that "the demands of organized labor for preferential legislation apparently know no bounds." He denounced the proposed bill to restrict injunctions

as class legislation in behalf of a minority of the labor element. He also declared the legislation would weaken the independence of the courts.

In an address on the small automatic stoker, E. L. Beckwith, of Chicago, president of the Midwest Stoker Association, said automatic heat is revolutionizing the domestic coal market.

Plans of the coal and heating equipment industries to promote the production, distribution and utilization of coal were outlined by H. A. Glover, chairman of a committee of 10 representing these industries, and by E. B. Langenberg of St. Louis, president of the Langenberg Manufacturing Company.

Trade practice methods were reviewed by E. C. Mahan, of Knoxville, chairman of the Trade Practice Section of the Market Research Institute.

Mine safety was covered in addresses by Ezra Van Horn, of Ohio, chairman of the Safety Committee of the association; Dr. J. J. Rutledge, of Baltimore, chief mine engineer of the Maryland Bureau of Mines, and Walter H. Glasgow, of Harrisburg, Secretary of Mines of Pennsylvania. Mr. Van Horn reported an increasing interest of operators and miners in accident prevention and stressed the necessity of cooperation in promoting safety. The work of Maryland in advancing safety through education, supervision and discipline was reviewed by Dr. Rutledge. Organized safety work in every coal mining company under the personal supervision of the management was favored by Mr. Glasgow.

The bankers view of the coal industry was given in an address by James L. Walsh, vice president of the Guardian Detroit Bank. He referred to "certain tendencies which seem to point to an even darker future for the coal industry." These were listed by him as increased efficiency in the use of coal for producing electric power which has decreased the market for coal by 35,000,000 tons annually, similar improvements in other industrial steam plants with a saving of 50,000,000 tons annually and a probable annual saving of 45,000,000 tons by railroads. With fuel oil, natural gas and water power absorbing a former market of 200,000,000 tons of coal a year, Mr. Walsh said it seems that 330,000,000 tons annually is "lost forever to bituminous producers." He suggested that the industry confer with other industries which are dependent upon bituminous in an effort to determine a basis upon which the coal industry may earn a reasonable profit. He suggested the merger of producing units from several districts with a view of obtaining "better national coverage and shorter shipment to market."

Walter Barnum, of New York, in reporting on the work of the Market Research Institute, advocated greater attention to developing automatic heating devices in maintaining the markets for bituminous.

That the value of the work of local associations to individual operators can hardly be overestimated was the consensus of the views presented at the local association luncheon-meeting held in connection with the annual meeting of the association. The keynote of the discussion was sounded by H. R. Hawthorne, New York City, Secretary and General Counsel of the Pocahontas Fuel Company, who presided and set forth, in very interesting and forcible language, the importance of the local association as the leader in the cooperative efforts of individual operators.

Distinct progress in the movement to organize local committees for joint service to coal consumers was registered at the meeting of the Committee of Ten—Coal and Heating Equipment Industries, held in connection with the meeting and presided over by Chairman Glover, General Manager of Sales, The Consolidation Coal Company. It was decided to select 25 key cities for local Committee of Ten meetings in the immediate future for the purpose of organizing local service committees and that the secretary distribute an outline for such meetings as compiled by a special committee of local meetings, which was headed by E. B. Langenberg, representing the National Warm Air Heating Association; also a proposed Constitution and By-Laws by Homer R. Linn, of the Boiler and Radiator Institute, which will be distributed among the members of the committee for consideration.

The question of financing the Committee of Ten movement was raised and it was decided to bring the matter before the board of directors of the National Coal Association. It was decided to hold the next meeting of the Committee of Ten in Columbus, Ohio, in December, in conjunction with the annual meeting of the National Warm Air Heating Association, the exact date of which will be announced later.

A tentative preliminary draft of a code of ethics relating to the buying and selling of bituminous coal was recommended for submission to the National Coal Association and the National Association of Purchasing Agents at a joint meeting of the contact committees of these associations. T. W. Harris, Jr., Wilmington, Delaware, Division Purchasing Agent of E. I. du Font de Nemours & Co., presided at the meeting, which was attended by a group of purchasing agents representing six important industries and by an equal number of operator-representatives of the National Coal Association under the chairmanship of J. P. Bradin, New York City, General Sales Manager of the Pennsylvania Coal & Coke Corporation. Certain details of the proposed code of ethics were referred to a special committee consisting of Mr. Harris and Mr. Huntress, Executive Secretary of the National Coal Association, for further consideration. When perfected, the code will be submitted to the two organizations concerned, for approval.

Contact committees representing the International Railway Fuel Association and the National Coal Association met October 16, to continue their cooperative efforts designed to be helpful in the handling of railway fuel coal. Several subjects of interest were discussed, among which were the possibilities of the railway fuel association's representatives passing along to industries the results of their investigations into fuel efficiency with a view to being helpful to industries in the selection and use of coal.

The growing demand for specially prepared coal for the use of stokers was discussed at length, and renewed efforts will be put forward to protect this class of coal from foreign substances when in transit. Renewed efforts will be put forward towards promoting the purchase of coal by carriers from mines located on the producing lines, and renewed faith was expressed in the policy recently adopted by the carriers of the country whereby it was agreed that coal would be purchased direct from producers or their accredited agents.

The meeting was attended by four representatives of the fuel departments of important railway systems and by an equal number of representatives of the National Coal Association.

Considerable discussion with reference to the effect of the introduction of domestic stokers upon the production and sale of coal developed at the joint meeting of the National Coal Association and the National Retail Coal Merchants' Association, under the chairmanship of Norman H. Vaughan, assistant general sales agent of the Consolidated Coal Company of St. Louis. It was agreed that retailers must give special consideration to furnishing coal adapted to stoker use and that operators must cooperate with retailers in that respect; and it was suggested that the interest of the stoker manufacturers should be enlisted in the work of standardizing stoker fuel.

Other subjects discussed at the meeting were the further study of standardization of coal sizes, the proper basis for distinction between sales of coal for domestic and for steam purposes, and the question of cash discounts, which was again postponed for further study.

Full proceedings of the convenion will be covered in a report which the National Coal Association will publish in the near future.

Committee to Revise Standard for Coal Mine Tracks

The scope of the project for the revision of American tentative standard "Coal Mine Tracks, Signals, and Switches" (M7a-1927) was approved as follows at the last meeting of the Standards Council:

"Standardization of coal mine tracks and signals, including switches, wood and metal ties and other items of track construction, together with recommendations of efficient installation and maintenance practices."

The sponsor for the project is the American Mining Congress. The Standards Council also approved the personnel of the sectional committee in charge of the work, under the chairmanship of F. C. Hohn, superintendent of transportation, Pine Hill Coal Company, Minersville, Pa. The committee, as approved, will include representatives of the following: American Electric Railway Association, American Institute of Mining and Metallurgical Engineers, American Mining Congress, American Society of Civil Engineers, Association of Manufacturers of Chilled Car Wheels, Coal Mining Institute of America, four commercial timber suppliers, eight manufacturers of special track work material, the National Electrical Manufacturers Association, the American Railway Association, Engineering Division, the United States Bureau of Mines. There will also be five members at large.

The most important feature of the present standard (M7a-1927) is the adoption of the 42-inch standard gauge for tracks in coal mines. This had been found to form the most suitable curve and the most useful frog angle for most coal mine work. The gauge had been in greater use than any other single gauge. For any case where other gauges might be imperative, alternative steps of 6 in. above and below are recommended. Complete specifications are included for riveted frogs, cast frogs, switch guards, rail turn-outs, and switch stands.

The general project has now been subdivided into three, M7a-1927 being one. The other two are: "Specifications for Coal Mine Cars" (M21) and "Specifications for Locomotives" (M25).

Coal Mine Fatalities in September

Reports received by the United States Bureau of Mines, Department of Commerce, from state mine inspectors, covering accidents at coal mines in the United States during September, showed a lower death rate per million tons of coal produced, for both bituminous coal mines in various states and for the anthracite mines of Pennsylvania, than was shown for August of the present year or September, 1929. The total number of men killed in all coal mines in the United States in September, 1930, was 132, which was 78 less than the number killed in September a year ago, and 31 less than in August, 1930. The production of coal varied from 51,877,000 tons in September, 1929, to 41,851,-

PRODUCTION, VALUE, MEN EMPLOYED, DAYS WORKED, AND OUTPUT PER MAN PER DAY AT COAL MINES IN THE UNITED STATES, IN 1929

(Exclusive of product of wagon mines producing less than 1,000 tons)

State	Net tons					Value		Number of employes						
								Underground						
	Loaded at mines for shipment	Sold to local trade and used by employes	Used at mines for power and heat	Made into coke at mines	Total quantity	Total	Average per ton	Miners, loaders, and shot firers	Haulage and track	All others	Surface	Total	Average number of days worked	Average tons per man per day
Alabama	17,459,449	317,675	166,799	.....	17,943,923	$37,309,000	$2.08	15,287	2,961	3,244	3,716	25,208	231	3.08
Alaska	94,600	5,010	1,000	.....	100,610	528,000	5.25	50	10	24	68	152	174	3.81
Arizona	.....	10,060	72	.....	10,132	44,000	4.34	33	2	2	2	39	137	1.90
Arkansas	1,659,573	26,020	9,515	.....	1,695,108	5,624,000	3.32	2,906	412	316	665	4,299	146	2.70
California, Idaho, Nevada and Oregon	7,840	2,222	260	.....	10,322	37,000	3.58	23	3	6	10	42	113	2.17
Colorado	8,664,817	824,049	183,746	248,129	9,920,741	26,254,000	2.65	7,981	1,227	1,226	1,623	12,057	187	4.40
Georgia	43,921	458	257	.....	44,636	136,000	3.05	.....	.....	.....	102	102	260	1.68
Illinois	55,712,372	3,991,337	953,932	.....	60,657,641	113,453,000	1.87	36,781	6,336	6,764	6,844	56,725	177	6.06
Indiana	17,387,599	630,524	326,235	.....	18,344,358	29,880,000	1.63	8,852	1,615	1,561	3,222	15,250	172	7.00
Iowa	3,383,801	800,029	57,239	.....	4,241,069	11,948,000	2.82	5,408	655	693	539	7,295	195	2.98
Kansas	2,635,600	251,807	88,564	.....	2,975,971	6,697,000	2.25	3,188	333	218	950	5,139	160	3.63
Kentucky	59,125,101	860,161	477,338	.....	60,462,600	93,283,000	1.54	36,090	7,586	7,203	7,770	58,649	222	4.64
Maryland	2,518,092	119,829	11,193	.....	2,649,114	4,640,000	1.75	2,170	395	362	362	3,289	246	3.28
Michigan	744,517	10,725	49,627	.....	804,869	2,904,000	3.61	899	164	154	119	1,336	217	2.77
Missouri	3,467,666	498,217	64,428	.....	4,030,311	9,778,000	2.43	3,433	402	447	1,336	5,618	185	3.87
Montana	3,221,905	137,790	47,831	.....	3,407,526	7,561,000	2.22	1,326	303	202	452	2,283	189	7.90
New Mexico	2,514,971	51,228	56,570	.....	2,622,769	8,314,000	3.17	2,107	350	294	482	3,233	214	3.79
North Carolina	46,280	3,200	2,700	.....	52,180	177,000	3.39	120	10	10	20	160	260	1.25
North Dakota	1,442,988	380,640	38,502	.....	1,862,130	3,157,000	1.70	772	92	74	483	1,421	192	6.84
Ohio	20,840,851	2,708,715	139,911	.....	23,689,477	35,733,000	1.51	17,689	2,452	2,093	3,165	25,399	201	4.64
Oklahoma	3,601,911	125,830	46,339	.....	3,774,080	11,481,000	3.04	3,944	733	616	1,058	6,321	178	3.36
Pennsylvania, bituminous	127,064,532	8,048,253	1,095,730	7,307,726	143,516,241	258,607,000	1.80	87,705	13,777	14,563	15,729	131,774	230	4.73
South Dakota	200	12,654	...	.....	12,854	38,000	2.96	32	.....	.....	.....	32	127	3.17
Tennessee	5,101,399	63,032	55,001	186,032	5,405,464	9,122,000	1.69	4,880	900	755	1,075	7,619	228	3.11
Texas	1,075,365	11,066	14,237	.....	1,100,668	1,600,000	1.45	885	128	105	195	1,313	212	3.95
Utah	5,072,527	47,955	16,678	23,361	5,160,521	12,725,000	2.47	2,076	467	323	592	3,458	211	7.09
Virginia	12,119,712	92,192	41,244	495,158	12,748,306	20,942,000	1.64	6,509	1,714	1,982	1,848	12,053	249	4.24
Washington	2,299,619	153,472	33,342	34,894	2,521,327	8,647,000	3.43	1,810	333	346	457	2,946	227	3.77
West Virginia	134,241,631	2,946,830	497,087	833,307	138,518,855	215,110,000	1.55	59,324	15,984	14,278	15,356	104,942	247	5.34
Wyoming	6,385,615	131,578	187,597	.....	6,704,790	17,052,000	2.54	2,948	629	508	754	4,839	230	6.02
Total, bituminous	497,934,454	23,262,568	4,662,974	9,128,607	534,988,593	*952,781,000	1.78	315,678	59,952	58,369	68,994	502,993	219	4.85
Pennsylvania, anthracite	65,294,579	3,233,023	5,300,593	.....	73,828,195	385,643,000	5.22	77,395	14,923	25,538	33,645	151,501	225	2.17
Grand Total	563,229,033	26,495,581	9,963,567	9,128,607	608,816,788	1,338,424,000	2.20	393,073	74,875	83,907	102,639	654,494	221	4.21

* These figures relate only to active mines of commercial size that produced bituminous coal in 1929. The number of such mines in the United States was 6,057 in 1929; 6,450 in 1928; 7,011 in 1927; and 7,177 in 1926.

Methods of mining in 1929: The tonnage by hand was 74,346,032; shot off the solid, 36,086,932; cut by machines, 403,606,717; mined by stripping, 20,268,099; not specified, 638,813.

Size classes of commercial mines in 1929: There were 209 mines in Class 1A (500,000 tons and over) producing 29.6 percent of the tonnage; 618 in Class 1B (200,000 to 500,000 tons) with 35.6 percent; 660 in Class 2 (100,000 to 200,000 tons) with 17.9 percent; 668 in Class 3 (50,000 to 100,000 tons) with 9.1 percent; 1,361 in Class 4 (10,000 to 50,000 tons) with 6.3 percent; 2,541 in Class 5 (less than 10,000 tons) producing 1.5 percent.

By F. G. Tryon and L. Mann, Statistics Section, Coal Division, U. S. Bureau of Mines.

000 tons in August, 1930, and 43,925,000 tons in September of the present year.

Bituminous coal mines, considered alone, had a death rate of 2.56 based on 99 fatalities and 38,632,000 tons of coal. These figures indicated a reduction of 66 deaths and 6,702,000 tons as compared with September, 1929, and a reduction of 18 deaths and an increase of 2,971,000 tons of coal mined as compared with August, 1930.

In the anthracite mines there were 33 fatalities during the month and 5,293,000 tons of coal mined, thus indicating a fatality rate per million tons of 6.23, which was slightly less than that of September a year ago when the death rate was 6.88, based on 45 deaths and 6,543,000 tons. The record for September was also better than for the preceding month of August when 6,190,000 tons of coal were produced and 46 men lost their lives by accidents, which resulted in a death rate of 7.43.

During the nine-month period of January to September, 1930, the total number of deaths from accidents in coal mines, both bituminous and anthracite, was 1,434 as compared with 1,563 for the same period a year ago. While there was a decrease in the number of deaths, there was also a decrease in the production of coal from 441,860,000 tons in the 1929 period to 390,575,000 tons in the 1930 period. This resulted in an increase in the fatality rate per million tons of coal mined, from 3.54 in 1929 to 3.67 in 1930. The death rate for bituminous mines alone was 3.25 and was practically the same as that shown for the nine-month period of 1929 when it was 3.13. These rates were based on 1,105 deaths and 339,542,000 tons in 1930, and 1,218 deaths and 389,255,000 tons in 1929. There was little difference in the record for anthracite mines, the rate for the 1929 period being 6.56, and representing 345 deaths and 52,605,000 tons, while that for the 1930 period was 6.46, representing 329 fatalities and a tonnage of 50,933,000.

There were no major disasters—that is disasters in which five or more lives were lost—at any coal mine during September, but eight such disasters occurred from January to August of the present year and resulted in a loss of 96 lives. There was one major disaster in September a year ago in which eight men were killed. During the period of January to September, 1929, there were five major disasters with a resulting loss of 83 lives. Based exclusively on these major disasters the death rates were 0.25 for 1930 and 0.19 for 1929.

In comparing the accident records for the first nine months of 1930 with the same period of 1929, a reduction is noted in the death rate from haulage accidents; increased rates are shown for falls of roof and coal, gas or dust explosions, and electricity. No change occurred in the rate for explosives.

West Virginia-Pittsburgh Coal Company Wins Disputed Tax Case

Note: Since this item was written the Board of Tax Appeals has withdrawn its decision, and has referred the case to one of its divisions for reconsideration.

The Board of Tax Appeals on October 8 sustained the West Virginia-Pittsburgh Coal Company in its contention that the invested capital for 1918 should have been $1,319,262.

The case was appealed on this and other legal phases after the Commissioner of Internal Revenue had declared deficiencies aggregating $138,740 existed in the returns of the company for the taxable years 1917, 1918, 1919, 1920, and 1922.

The opinion, written by Commissioner Smith, held:

First: Expenditures for additions to coal-mining machinery and equipment bought for the sole purpose of maintaining normal production are deducible as expenses of the year when purchased and installed.

Second: The full value as of January 1, 1914, of the physical property acquired by the petitioner May 1, 1912, is includable in the invested capital for 1917.

Third: The coal company had no earned surplus at the beginning of the taxable year 1918 and made no distributions to stockholders from the date of its organization.

Fourth: A reduction in the amount of capital stock outstanding in 1915, without any distributions being made to the stockholders, did not operate to reduce invested capital.

Named Superintendent of Utah Mine

R. R. Kirkpatrick has been named superintendent of the Standardville Mine of the Sevier Coal Company, succeeding Stanley Harvey, who resigned to become superintendent of the Sevier Coal Company's properties in Salina Canyon, Utah.

For 20 years Mr. Kirkpatrick was connected with the Utah Fuel Company and for the past two years was superintendent of the Blue Blaze Coal Company at Consumers. Prior to taking over that position he was superintendent at Sunnyside.

Mr. Harvey had been at Standardville for a year and a half. Before going there he was with the Utah Fuel Company at Winter Quarters and Castlegate.

Jamison Coal & Coke Co. To Install Cleaning Plant

The Jamison Coal & Coke Company of Greensburg, Pa., has awarded the Fairmont Mining Machinery Company a contract covering design and installation of a 150-ton per hour Peale-Davis pneumatic coal cleaning plant at their Crabtree, Pa., operations. In addition to the Peale-Davis unit the contract covers a wood structure with all necessary auxiliary equipment.

The new unit will clean minus 1 in. coal on a single table. From the table the clean coal passes over a ⅜-in. mesh screen with the over-size feeding to a crusher. The minus ⅜-in. product is then conveyed to storage bins from which it can be loaded directly to the coke oven larries or in railroad cars.

The decision to replace the present wet washing plant by air cleaning was made to eliminate the complaints of customers, caused by the freezing of wet slack coal in the cars during cold weather.

Richard H. Edmonds Dies

In the passing of Richard H. Edmonds, editor of the *Manufacturers Record*, who died at his home in Baltimore on October 4, the South has lost its most devoted champion and constructive leader.

For over 50 years with the *Record*, and for many years its editor, no clearer thinking articles, and no sounder adherent of American ideals, ever led public thought.

Every year a personal message from him sounded the keynote of the Industrial Development Conferences of the Southern Division of The American Mining Congress. At the Little Rock conference in March last he wrote:

"Southern States have been hindered by interminable political disputes, not between parties but within one party. If groups of Southern States could band together into organizations for cooperative work covering every phase of the resources and potentialities, progress in agriculture and industry in the next 10 years would exceed all that has been done in the last 25 years."

Anthracite Shipments—September

Shipments of anthracite for the month of September, 1930, as reported to the Anthracite Bureau of Information, Philadelphia, amounted to 3,899,405 gross tons. This is a decrease as compared with shipments during the preceding month of 922,385 tons and when compared with the month of September, 1929, shows a decrease of 1,460,725 tons.

Prominent Coal Man Dies

David V. Randall, general manager of the Susquehanna Collieries Company and The Lytle Coal Company, of Wilkes-Barre, Pa., was stricken with a heart attack on September 16 at Portland, Oreg., and died suddenly. He had not fully recovered from a heart attack which he suffered last fall. Mr. and Mrs. Randall had been touring the West since September 2.

For several years Mr. Randall was attached to the coal department of the Delaware & Hudson Railroad Company. In 1898 he became affiliated with the Susquehanna Collieries Company and The Lytle Coal Company in the engineering department. Soon afterward he was made division engineer of the Lykens division and later transferred to a similar position in the Nanticoke division. His next promotion was as superintendent of the William Penn Colliery at Shenandoah. Later he was advanced to the superintendency of The Lytle Coal Company, with headquarters at Minersville.

In 1919 Mr. Randall was made supertendent of the Shamokin division of the company's collieries and retained that position until November 1, 1927, when he was appointed general superintendent, with headquarters in Wilkes-Barre. Since August 10, 1928, he had served in the capacity of general manager, with headquarters at the same address.

Holds Gravel Deposit Not a Mine

In deciding the case of the Parker Gravel Co., of Shreveport, involving taxes of $1,000 for 1925, the Board of Tax Appeals rules that a gravel pit or deposit is not a mine under Section 204 (c) (1) of the 1926 Revenue Act and is not entitled to deduction for depletion based on discovery value.

"In its primary and restricted sense a mine denotes an underground excavation for the purpose of getting minerals," says the board. "In the Revenue Act Congress did not use the word mines in its broadest sense, but provided for a reasonable allowance for depletion in the case of (1) mines, (2) oil and gas wells, (3) other natural deposits, and (4) timber. Congress did not intend to use the word mines to embrace oil and gas wells or other natural deposits, since these are separately specified. In its broadest sense, gravel, like oil and gas, may be considered to be a mineral, but in its restricted sense it is not a mineral. The allowance for depletion based upon discovery value being authorized only in the case of mines such a deduction is as effectively prohibited in the case of property not coming within that classification as if the statute specifically so stated."

DOMESTIC GRAPHITE SOLD IN 1929

The total quantity of graphite sold by graphite miners in the United States in 1929 and its value were considerably larger than the corresponding figures for 1928, according to a statement by the Bureau of Mines. The sales of natural graphite by producers in 1929 were 6,458 tons, valued at $310,891, an increase of 847 tons, or 15 percent in quantity, and $13,798, or 5 percent in value. The increase in quantity of sales was chiefly in the amorphous variety.

The foregoing figures represent the sales or shipments of graphite. The production figures are somewhat different. Only one amorphous graphite mine was in operation in 1929, that of the Carson Black Lead Co., in Nevada. Two others used or sold material from stock mined previously. The production of crystalline graphite in 1929 was 5,425,900 pounds, compared with 5,500,000 pounds in 1928.

The imports of graphite in 1929 amounted to 24,072 short tons, valued at $1,066,834, compared with 17,569 short tons, valued at $801,559, in 1928, an increase of 37 percent in quantity and 33 percent in value.

BOOK REVIEW

THE SCIENTIFIC FUNDAMENTALS OF GRAVITY CONCENTRATION, by Josef Finkey, E. M., professor of ore dressing, School of Mines, Sopron, Hungary. Translated into English by C. O. Anderson and H. M. Griffitts. Bulletin, School of Mines and Metallurgy, University of Missouri, Rolla, Mo. Price, $1.

This translation of Josef Finkey's "The Scientific Fundamentals of Gravity Concentration" gives the ore-dressing profession the outstanding treatise on gravity concentration in recent years.

The authors realize the need of this classic in our literature, as the theory of this phase of ore dressing has been but lightly touched in our recent textbooks, although numerous scattered articles, particularly on coal preparation, have appeared. It is fitting that this work be published at the present time when many of the large mining companies are expanding their research programs, as it gives the research workers a sound mathematical analysis of the laws underlying classification, jigging, and tabling processes.

The tremendous growth of the flotation process has, it is true, largely superseded gravity concentration in the metal field, but there remains the vast field of coal preparation and those metallic and nonmetallic ores which lend themselves best to a combination of flotation and gravity concentration processes.

Professor Finkey's treatise is largely confined to a mathematical exposition of gravity concentration processes, and he utilizes the previous experimental works of Richards, Stokes, Wagoner, Rittenger, and others, to interpret his deductions. Of necessity, Professor Finkey employs higher mathematics throughout his work, and he uses hyperbolic functions to express his various conclusions.

In addition to the derivation of fundamental equations, the treatise contains many observations and conclusions regarding gravity concentration practice, particularly European practice. This should be of value to the operator who is attempting to better his present results.

This translation of Josef Finkey's treatise will find favor both in the operation and teaching field of ore dressing.

J. R. CUDWORTH,
Acting Director, School of Mines,
University of Alabama.

WESTERN DIVISION MEETING

(*From page 866*)

a luncheon. During the meeting, trips of inspection were made by many to the plants of the El Paso Smelting Works, the Southwest Portland Cement Company, El Paso Electric Company's Rio Grande Power Station, El Paso Cotton Industries, Nichols Copper Company, Pasatex Petroleum Company, Texas Company and the Rio Grande Oil Company.

On Thursday, October 16, trips were arranged to Silver City and Hurley, N. Mex., to inspect the Chino mines and mills and to Carlsbad, N. Mex., to visit the Carlsbad Caverns.

EDUCATING THE MINER

(*From page 862*)

or leg of the worker. The axe handle should be short and should be held near the end to avoid the exposed end catching in clothing or striking against some other object and deflecting the blade.

So far we have merely scratched the surface in regard to instructions to the miner; the above details were mentioned to give an idea of how important it is to catch every small item; none is too small to overlook.

Get your bosses together in a room provided with a large blackboard. Make out a list of payroll jobs—each of these jobs can be broken up into work jobs—and divide each work job into each operation; how to do the operation, with special information. The bosses, themselves, will be surprised that there are so many operations, and will receive an education while analyzing the various jobs.

This is no wild dream but has been proved a success in several of the mines in the Rocky Mountain Region, and has attained excellent results.

WITH THE MANUFACTURERS

Worthington Acquires Gilman Mfg.

The Worthington Manufacturing Company has acquired the Gilman Manufacturing Company, East Boston, Mass., marking another milestone in the progress of this corporation. Primarily, they are expanding their line of pneumatic service to mines, quarries, contractors and industry—manufacturing under one head, with one responsibility, the Gilman line of rock drilling equipment which so logically supplements the line of Worthington Feather Valve air compressors. Each installation will be thoroughly engineered in the light of the combined experience of Worthington and Gilman engineers.

Goodman Now Agent For Chicago Conveyor and St. Louis Shovel Co.

Chicago Automatic Conveyor Company of Cicero, Ill., announce the appointment of the Goodman Manufacturing Company as exclusive sales agents in the entire mining fields of the United States, Canada, and Mexico, for the "Red Devil" pit car loader.

St. Louis Power Shovel Company of St. Louis, Mo., announce the appointment of the Goodman Manufacturing Company as exclusive sales agents in Mexico and the states of Arizona and New Mexico for the Conway power shovel.

National Carbon Company Enters the Field of Lubrication

Beginning November 1, the entire line of "Gredag" lubricants, manufactured by the Acheson Graphite Corporation, a unit of the Union Carbide and Carbon Corporation, will be distributed and sold by the Carbon Sales Division of National Carbon Company, Inc., with headquarters at Cleveland, Ohio. The Carbon Sales Division of National Carbon Company has been active for many years in the sales and distribution of carbon, graphite and metal graphite brushes, illuminating carbons, welding carbons and numerous carbon specialties of importance to many industries. The addition of Gredag to the products of the Carbon Sales Division is considered a most logical step by National Carbon Company because this division of the company is in continuous contact with industrial plants and distributors of industrial products throughout the country. As is the case with its industrial carbon products, sales and technical service on all Gredag lubricants will be available at the branch offices and service plants of the Carbon Sales Division located in New York City, Pittsburgh, Birmingham, Chicago and San Francisco.

Publishes Catalog in Spanish

An attractively illustrated catalog of Hercules explosives printed in the Spanish language, has just been issued by Hercules Powder Company, Wilmington, Del.

Intended as a reference book on explosives for Hercules' clients in Latin America the new booklet describes explosives, blasting accessories, and smokeless powder. It is illustrated with Latin American scenes.

The catalog will be an important sales aid in Hercules explosives export business. It may be obtained by writing the company at Wilmington, Del.

Aluminum Company of America Purchases Westinghouse Equipment

The Aluminum Company of America have purchased an ageing oven and a roller hearth furnace from the Westinghouse Electric and Manufacturing Company for installation at their Alco, Tenn., plant.

Link-Belt Receives New Ore Screening Plant Contract

Link-Belt Company, Chicago, Ill., has just received a contract from the Interstate Iron Company, Virginia, Minn., for an iron ore screening plant.

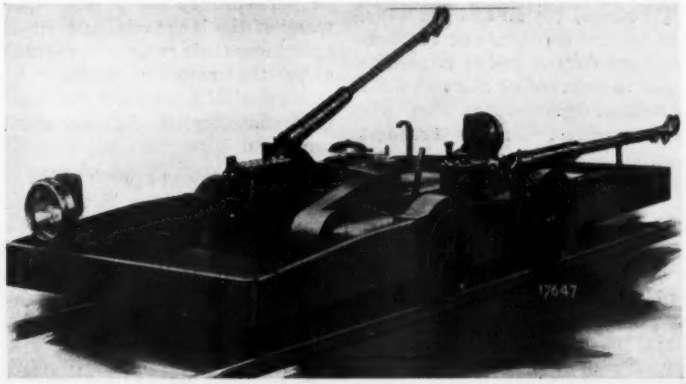
INSPECTION CAR MEETS LONG FELT NEED

The Jeffrey Manufacturing Company, of Columbus, Ohio, has recently brought out a mine inspection car which promises to be particularly useful in low seams where walking is difficult. It is not a locomotive, but is designed especially for passenger transportation. However, it answers other important needs besides inspection service, such as emergency runs by electricians and mechanics in case of machinery breakdowns, and first-aid service and quick transportation in case of accident.

The car is of all-steel construction, with a wood lined floor for riding convenience. A powerful headlight mounted on either end of car provides safe traveling under its maximum speed of seven miles per hour. The underslung construction of the body prevents teetering or dragging when weight is all in one end.

In the 48-in. gauge car illustrated here, from four to six men, besides the operator, can be conveniently carried in a sitting position, or two men and operator in a laying position.

The operation of the mine inspection car follows standard mine locomotive control. All electrical and moving parts, wheels, etc., are carefully shielded to provide absolute safety to operator and passengers. Braking is accomplished by an efficient, quick-acting band brake on one axle, which is operated by a lever. Either one or two trolley equipments can be furnished.



New Atomic Hydrogen Welding Machine Is Automatic

The General Electric Company announces a new automatic welder for atomic hydrogen welding. This is the first application of automatic equipment to this welding process, previous atomic hydrogen welders being for hand welding only. The equipment was exhibited for the first time at the National Metals Exposition in Chicago, September 22 to 26.

The new welder is designed for longitudinal seam welding of all kinds. It consists of a clamping mechanism for holding the work, an automatic travel carriage, a welding head and the usual control devices, and other accessories. The clamping mechanism and travel carriage are of standard types, while the welding head, control, etc., are of special design to suit the use of atomic hydrogen welding. In addition there is an auxiliary feeding device for feeding filler rod into the arc, as the tungsten electrodes used to form the arc are consumed slowly and do not contribute metal to the weld.

In operation the work is clamped in place in the usual manner, the travel carriage is set at one end of the seam and the "start" push button is depressed. The remainder of the operation is automatic. With the pressing of the "start" button the line contactor closes, applying power to the equipment and simultaneously opening a valve supplying hydrogen to the arc. The striking of the arc, movement of the travel carriage and length of the arc are all controlled automatically.

The atomic hydrogen welding process is one by means of which hitherto unweldable metals can be melted and fused without trace of oxidation, and welding can be performed in some cases on metals as thin as a sheet of ordinary writing paper. The method utilizes the passage of a stream of hydrogen through the arc between two electrodes. The heat of the arc breaks up the hydrogen molecules into atoms and these combine again a short distance beyond the arc into molecules of the gas. In so doing they liberate an enormous amount of heat and thus more effective welding temperatures can be obtained than with the usual welding methods. In addition, since atomic hydrogen is a powerful reducing agent, it reduces any oxides which might otherwise form on the surface of the metal. Alloys containing chromium, aluminum, silicon or manganese can thus be welded without fluxes and without surface oxidation.

General view of the automatic hydrogen welding equipment with arc struck and operator watching

Link-Belt Makes Improvement At Indianapolis Plant

Having recently completed a new factory at Toronto, Canada, as well as an entirely new plant to house their Pacific Division at San Francisco, Calif., the Link-Belt Company now announces another improvement for their Indianapolis foundry. They have just closed a contract for a powdered coal system entailing an expenditure of $125,000.

This contract covers the installation of a powdered coal system at this plant, where Link-Belt chains for elevating and conveying are made. A building to house the system, and alterations in the plant, will be included in the improvements.

Preparation for future business was given as the reason for adding this equipment at the present time. This system will modernize the process of firing the melting and annealing furnaces and the heating of the boilers.

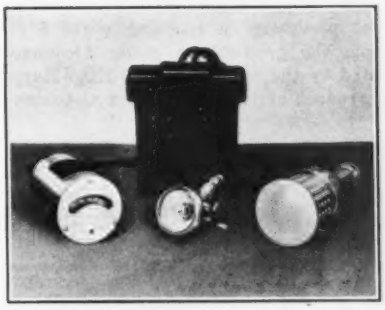
Mr. Alfred Kauffmann, president of Link-Belt, stated when interviewed, "Now, during the slack production period, is the time to perfect manufacturing processes and prepare for future business. We believe in practicing what we preach."

New M-S-A Catalog

The Mine Safety Appliances Company, Pittsburgh, Pa., has just published the M-S-A First-Aid Materials Catalog No. FA-2, which will be of special interest to all users and buyers of first-aid materials. It is a 36-page catalog, profusely illustrated, and covers the complete line of first-aid materials manufactured by this company for industrial and mining use. The completeness of the catalog is illustrated by the fact that it contains such items as poison ivy treatments, auto kits, hot pads, mercurocompresses bandages, etc. Copies will be furnished gratis to those interested in first-aid work upon application to the company.

U. C. C. Methane Indicating Detector

The Union Carbide Sales Company announces the new U. C. C. Methane Indicating Detector for testing air in coal mines. The distinctive features of this instrument are portability, a scale which shows the percentage (from 0.1



to 7.0) of methane present, a detecting head that can be located wherever desired, and exceptional accuracy.

The outfit consists of a detector head, a meter case, a portable storage battery, and a cap lamp. Combustion of a methane and air mixture on the surface of a glowing non-catalytic filament increases its temperature and electrical resistance, thereby actuating a milliammeter needle.

The complete outfit weighs about 12 pounds, is worn strapped to the back and chest, and will operate continuously for five hours without change of battery. The detecting head is attached to a flexible cable and can be placed anywhere a test is to be made. The dial is on top of the meter case which is worn on the chest; the control switches are recessed in the bottom. The cap light furnishes illumination for reading and inspection. The detector is ruggedly built and has safety features which permit changing of filaments even in gaseous areas. A spare battery and all necessary tools are included.

Gelamite Explosive Described

A new type of explosive being manufactured by the Hercules Powder Company, is described in a booklet, "Hercules Gelamite," just issued.

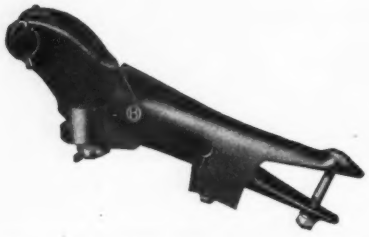
Gelamite, the result of years of re-

search in Hercules laboratories, is an economical substitute for gelatin dynamites up to 60 percent strength at a saving of 10 percent to 20 percent in explosives costs, according to the booklet. Its characteristics—water resistance, cohesiveness and plasticity, strength, safety, and suitable fumes, compare favorably with the gelatin grades and can be used more economically. In mines, quarries, open pits, and in construction work, gelamite has proved its worth in blasting tests.

Weight equivalents for the replacement of Gelatine Extra L. F. and cost per cartridge is included in the booklet. It may be secured by writing the Hercules Powder Co., Wilmington, Del.

Horizontal Pole to 6-Ft. Wire Is Range of New Universal Harp

Trolley pole angles from horizontal to that necessary in reaching wires 6 ft. from the ground are easily accommodated by the new Universal Mine Harp, a product of the Ohio Brass Company,



Mansfield, Ohio. While designed particularly for low seam operation, the construction and design are of such a nature that it will operate perfectly where the trolley wire is as high as 6 ft. above the rail.

Two types of this new harp are available. One is of a self-aligning design, so constructed that the head always tends to assume a position parallel to the pole by means of a coil spring contained in the bearing. The other type is alike in all other respects except that it is of a non-aligning design. This harp is free trailing and will follow wires, frogs, and special pieces with ease and certainty.

No protruding angles on the harp will catch on I-beams or overhead timbers in the event of a dewirement.

Either trolley wheels or shoes may be accommodated in the harp head, and in the event the shoe is used with extra heavy currents, a pigtail shunt is furnished on order. Copper contact bearing washers, for use between the ball and socket connections of the harp and shoe, are regularly furnished with either steel or bronze trolley shoes.

Both the harp and pole head are of Flecto Malleable Iron and finished with red Duco.

New Promal Chain Book Issued By Link-Belt

Link-Belt Company, 200 South Belmont Ave., Indianapolis, Ind., will send gratis, upon request, a 32-page comprehensive data book devoted to "Promal" chains. "Promal" is Link-Belt's new, strong, long-wearing metal for cast chains, for power transmission and conveying services.

This new book, No. 1050, describes Promal chains, both plain links and attachments, for use where the inherent qualities of Promal are desired. Dimensions, strengths, list prices and weights, are given in this data book.

A New Bearing Metal Developed by Westinghouse

An amazing new bearing metal in the form of a self-lubricating bearing has been invented by W. C. Wilharm of the Westinghouse Research Laboratories.

It has been estimated that these bearings are 10 times as efficient as the so-called "oil-less" bearings in use today.

Practically all bearings of this kind are mounted without oil or grease in motors which turn only a few revolutions, and then are idle for a considerable time.

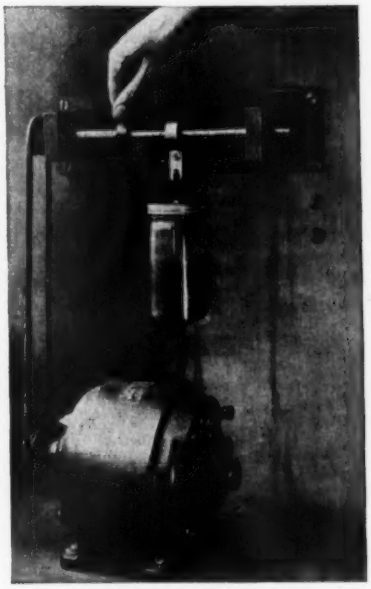
The new bearing can also be used with lubricant instead of the present oil-requiring bearing materials. If the supply, or film, of lubricant should for any reason become inadequate, the bearing is capable of resisting the heating action of friction for a considerable length of time by means of its own lubricating qualities.

After this metal has been placed on a production basis and the cost reduced, this development shows promise of revolutionizing the construction of bearings wherever they are used—whether in delicate instruments such as typewriters, calculating machines, microscopes, telescopes, etc., or in automobiles, airplanes, steamships, and electrical apparatus.

"This new bearing is the result of countless tests in the Westinghouse Research Laboratories to determine what materials reduce friction most," says a Westinghouse announcement. "When these were discovered, it was found that they could not be incorporated in an oil. Therefore, they were put in the bearing itself—right where they were needed.

"The bearing is made by mixing one or more metallic powders with one or more materials yielding a soapy substance. The ingredients are put in a cold mold and subjected to a pressure of approximately 40,000 pounds per square inch. The temperature is gradually raised until it reaches about 400 degrees Fahrenheit—nearly twice that required to boil water. After keeping the mold at this temperature for half an hour, the pressure is raised to 200,000 pounds per square inch. The pressure is then released and the mold allowed to cool. After this, the bearing is removed from the mold.

"Bearings made of this new material can either be made to certain specifications according to the mold used or they



The new bearing metal undergoing tests in the Westinghouse laboratories

can be made in blank and machined to the size desired. This permits low production cost where many bearings of the same size are required and availability of many sizes with small stock where there is need for few bearings of various sizes."

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912,

OF THE MINING CONGRESS JOURNAL, published monthly at Washington, D. C., for October 1, 1930.

City of Washington,
District of Columbia, ss:

Before me, a notary public in and for the state and county aforesaid, personally appeared Walter Lukei, who, having been duly sworn according to law, deposes and says that he is the news editor of THE MINING CONGRESS JOURNAL, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in Section 411, Postal Laws and Regulations, printed on the reverse side of this form, to wit:

1. That the names and addresses of the publisher, editor, and business managers are:

Name of publisher, The American Mining Congress, Washington, D. C.

Editor, E. R. Coombes, Washington, D. C.

2. That the owners are: The American Mining Congress—a corporation, not for profit. No stockholders. President, Robt. E. Tally, Clarkdale, Ariz. Secretary, J. F. Callbreath, Washington, D. C.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

WALTER LUKEI,
News Editor.

Sworn to and subscribed before me this 17th day of October, 1930.

[SEAL] JAMES C. MARRIOTT,
Notary Public.

(My commission expires October 10, 1934.)

INDEX TO ADVERTISERS

. . . YOU WOULD OPEN YOUR DOORS IMMEDIATELY TO ANY ONE OF THESE MEN

ROBERT E. TALLY, President of the United Verde Copper Company and President of The American Mining Congress; SCOTT TURNER, Director of the United States Bureau of Mines; NOAH SWAYNE, Director of the Anthracite Institute; LOUIS S. CATES, President of the Phelps Dodge Corporation; F. H. PROBERT, Dean, University of California; LUCIEN EATON, of the Cleveland-Cliffs Iron Company and Chairman of the Metals Branch, Standardization Division, The American Mining Congress; R. M. WATT, Kentucky Utilities Company and Chairman of the Southern Division of the American Mining Congress; E. A. HOLBROOK, Dean of the University of Pittsburgh; others not yet definitely scheduled will probably include a member of the Senate Committee on Mines and Mining; an outstanding tax authority; a well-informed member of the Department of Commerce.

These are the men who will contribute leading articles to the December issue, *The Mining Congress Journal*. Under consideration will be the most important problems confronting the industry today. Stabilization of minerals — government in mining—the Senate and mining—the young engineer's opportunity—mineral taxation—the future of western minerals—the authracite industry—the future of the South's minerals—the march of mechanization—progress of standardization. These are some of the critical topics that will be discussed next month.

January will be a review of conditions in all branches of mining and in all mining localities. Representatives of a score or more local and national associations will contribute to describe these conditions to you.

The MINING CONGRESS JOURNAL

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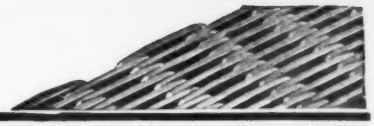

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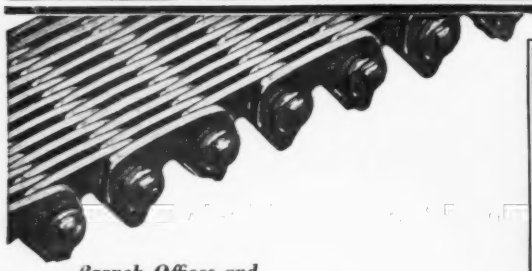

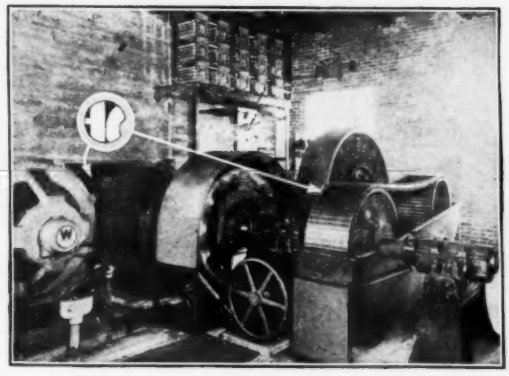

Two Morse Silent Chain Drives (one main fan drive and one an auxiliary emergency drive) to drive ventilating fan at the Wildwood Mine of the Butler Consolidated Coal Company.

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